The Tool Engineer

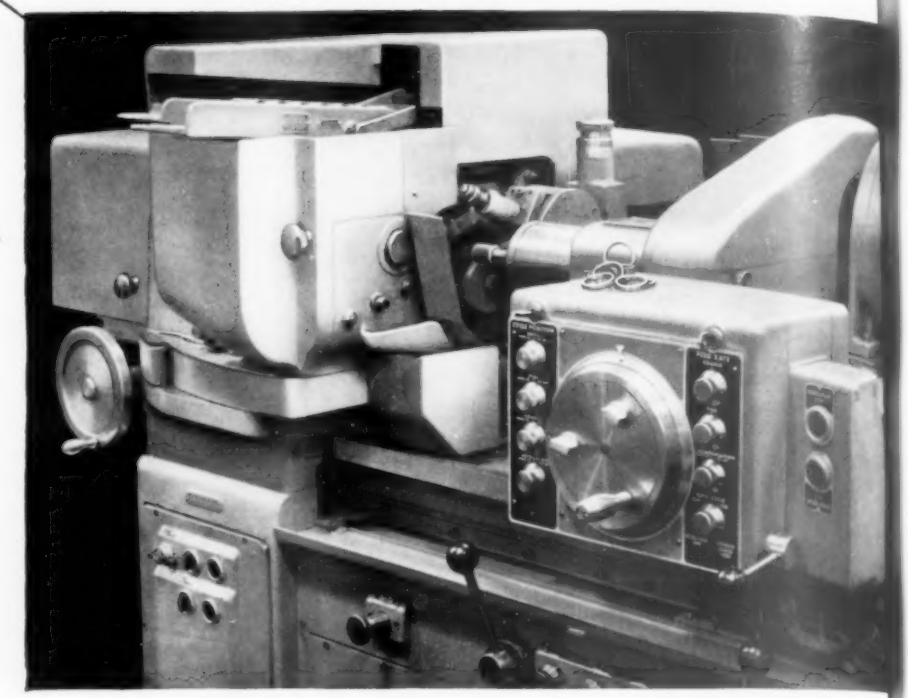
DRILLING MACHINE CLASSIFICATION . . . Page 69

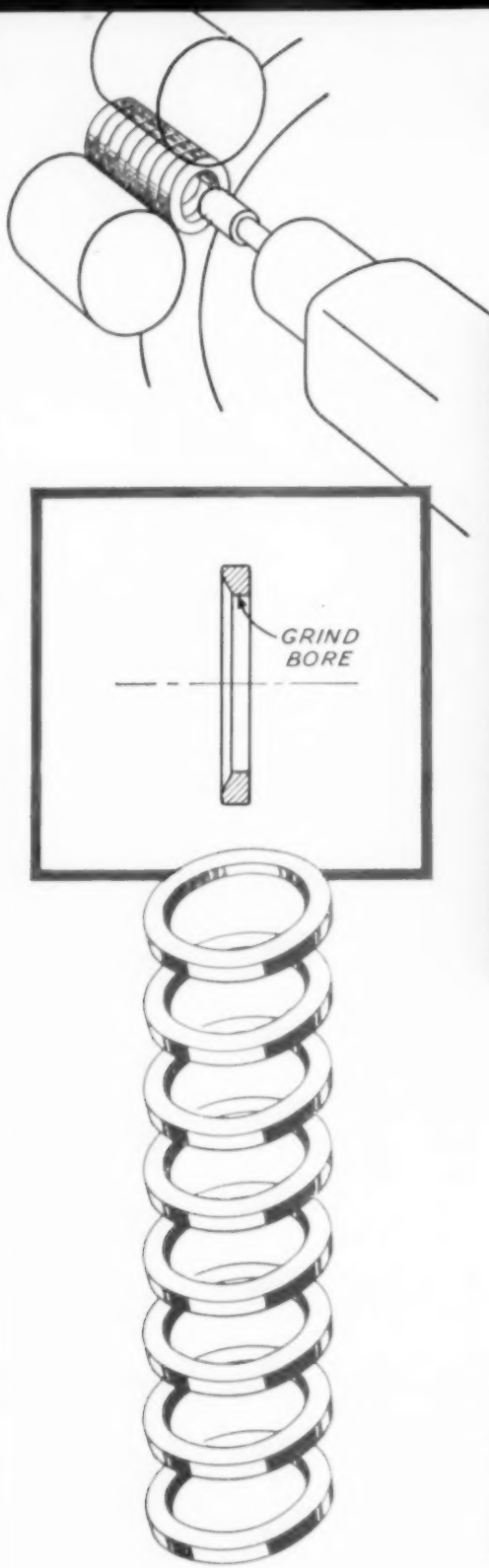
PUBLICATION OF THE AMERICAN SOCIETY OF TOOL ENGINEERS

NOVEMBER, 1952
VOLUME XXIX, NO. 5

PLANNING
ENGINEERING
CONTROL
OF
TOOLING
EQUIPMENT
PRODUCTION

Here's How the Heald handles a multiple grinding job





valve seat inserts ground 8 AT A TIME on a Heald Model 281 Centerless

With this fully automatic Heald Centerless Internal, valve seat inserts are ground eight at a time. The parts are stack loaded and drop into grinding position automatically, where they are located and rotated between the support, pressure and regulating rolls. Since they are rotated on their own outside diameter, concentricity between ground bore and O.D. is easily maintained. Size-Matic sizing is also fully automatic. Once the machine is started, all the operator has to do is keep the loading chute filled and remove the finished parts from the unloading chute.

This is typical of the high production efficiency that you can get with a Heald Centerless Internal. Remember — when it comes to precision finishing, it pays to come to Heald.

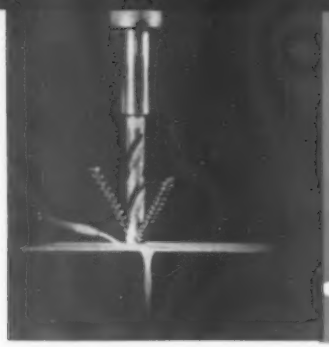
HEALD

Heald precision speeds the nation's production

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New Yo



The Tool Engineer

Volume XXIX, No. 5 November, 1952

TECHNICAL ARTICLES

Gadgets

SPECIAL REPORT

ASTE NEWS

DEPARTMENTS

THE TOOL ENGINEER is regularly indexed in *The Industrial Arts Index.*

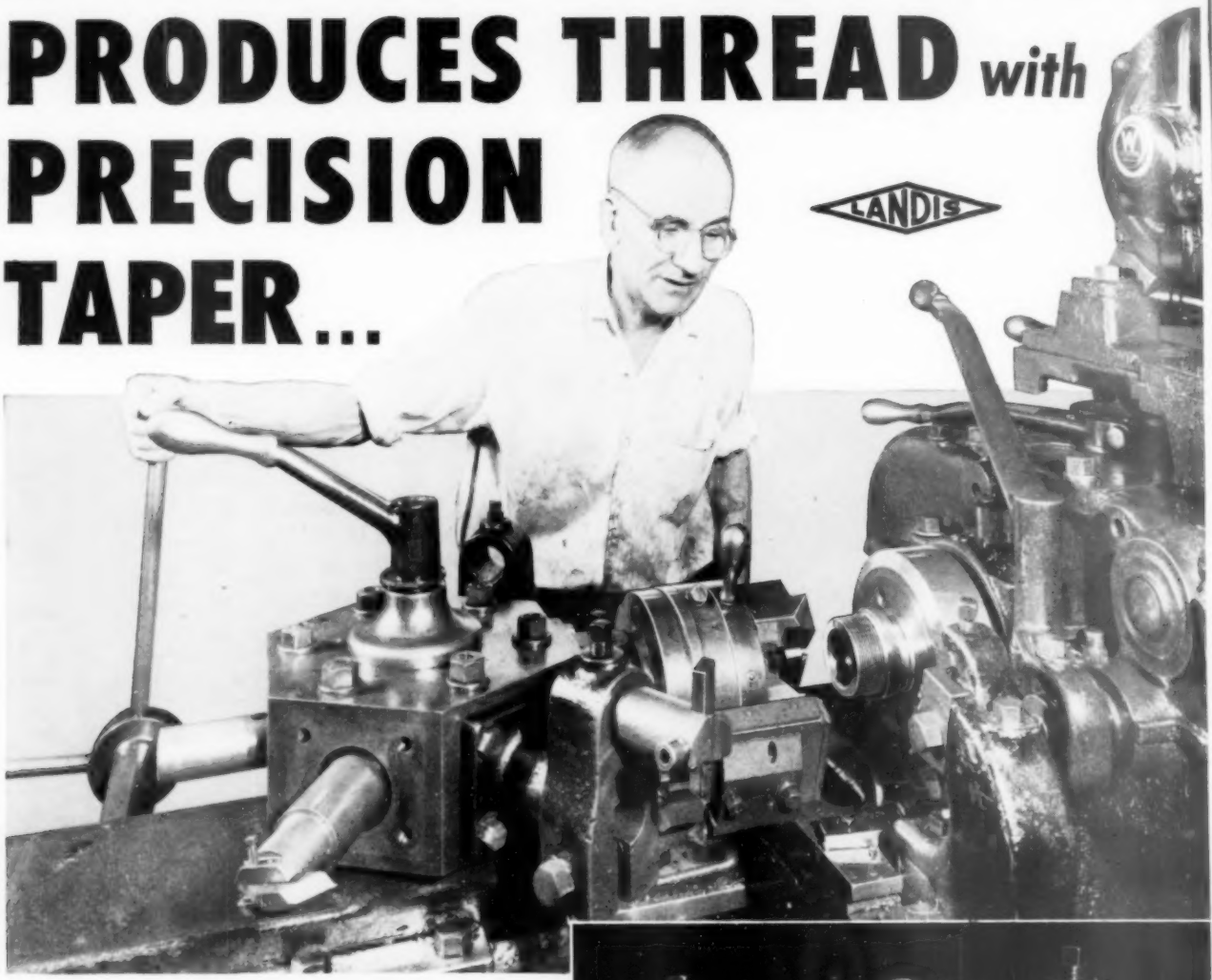
AMERICAN SOCIETY OF TOOL ENGINEERS

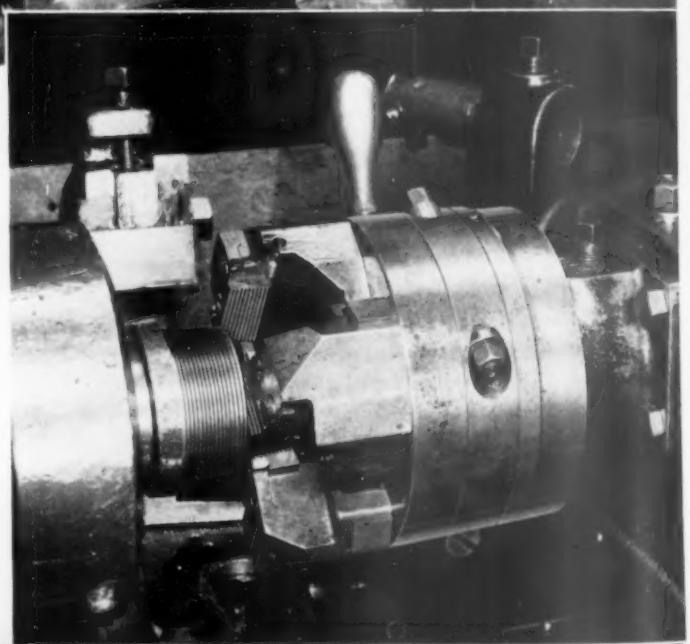
THE TOOL ENGINEER is published monthly in the interest of the members of the American Society of Tool Engineers. Entered as second-class matter, November 4, 1947, at the post office at Milwaukee, Wisconsin, under the Act of March 3, 1879. Yearly subscription for members, $2.00. Non-members, $6.00. Canada, $6.50; all other countries, $8.00 per year.

OFFICE OF PUBLICATION: 239 E. Chicago St., Milwaukee, Wis.
EXECUTIVE AND EDITORIAL OFFICES: 10700 Puritan Ave., Detroit 21, Michigan.

LANDMATIC DIE HEAD PRODUCES THREAD *with* PRECISION TAPER...

LANDIS





The 2" LANDMATIC Die Head with Taper Attachment illustrated is designed for cutting tapered threads where precision and thread finish are of prime importance.

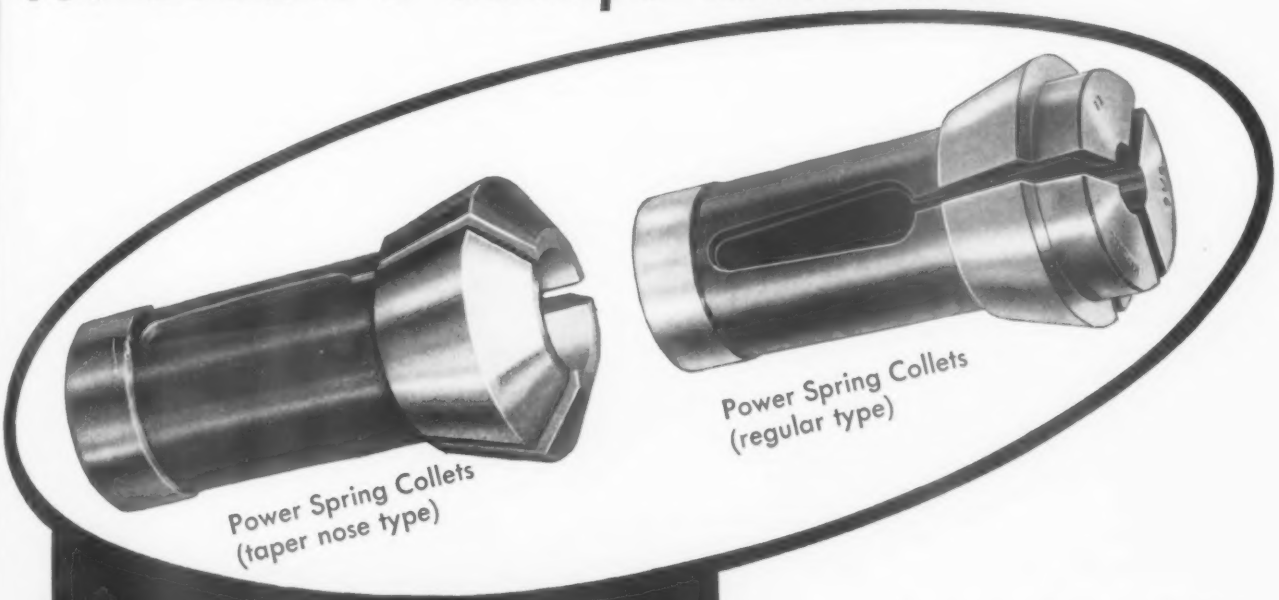
The mechanically-controlled operation of the taper attachment causes the chasers to expand on diameter as the work enters the die head. Thus, cutting strains normally encountered in producing tapered threads are minimized. This results in finer thread finish, greatly improved accuracy, and materially longer chaser life.

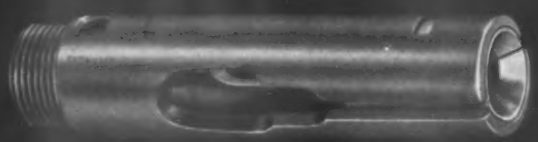
The value of the taper attachment is particularly apparent when cutting threads with high taper or of lengths greater than those ordinarily used for standard pipe threads. Write for Bulletin F-90.

LANDIS *Machine* COMPANY · WAYNESBORO PENNSYLVANIA

HARDINGE
ELMIRA, N.Y.

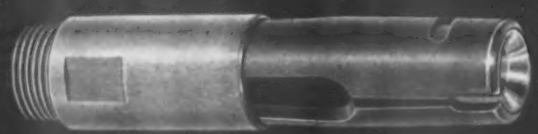
COLLETS and FEED FINGERS for Brown & Sharpe machines





Master Feed Fingers and Pads

Feed Fingers (regular type)



Master Feed Fingers with Adjustable Tension for No. 00, 00G, 0 and 0G Machines.

To get maximum production efficiency from your Brown & Sharpe Automatics and Wire Feed Screw Machines — specify HARDINGE Collets and Feed Fingers.

Specifically engineered, customer-shop tested and approved for Brown & Sharpe Machines, Hardinge Collets and Feed Fingers will reduce tooling costs and step up production.

Write for Catalog 36 — contains complete descriptions, specifications and ordering information.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

small investment– BIG JOB

Cincinnati Shapers can be profit builders for you. Write for Catalog N-5 for full information.

An unusual undercutting operation

These large sidearms for stamping presses are machined on Cincinnati Shapers very profitably and efficiently, for two reasons—low investment and accurate, speedy performance.

This battery of rigid, powerful Cincinnati Shapers at Arrow Metal Products Co. is equipped with the Electro-Magnetic Clutch for speed and dependable operation. Modern controls are conveniently located for the operator, and also contribute to efficiency.

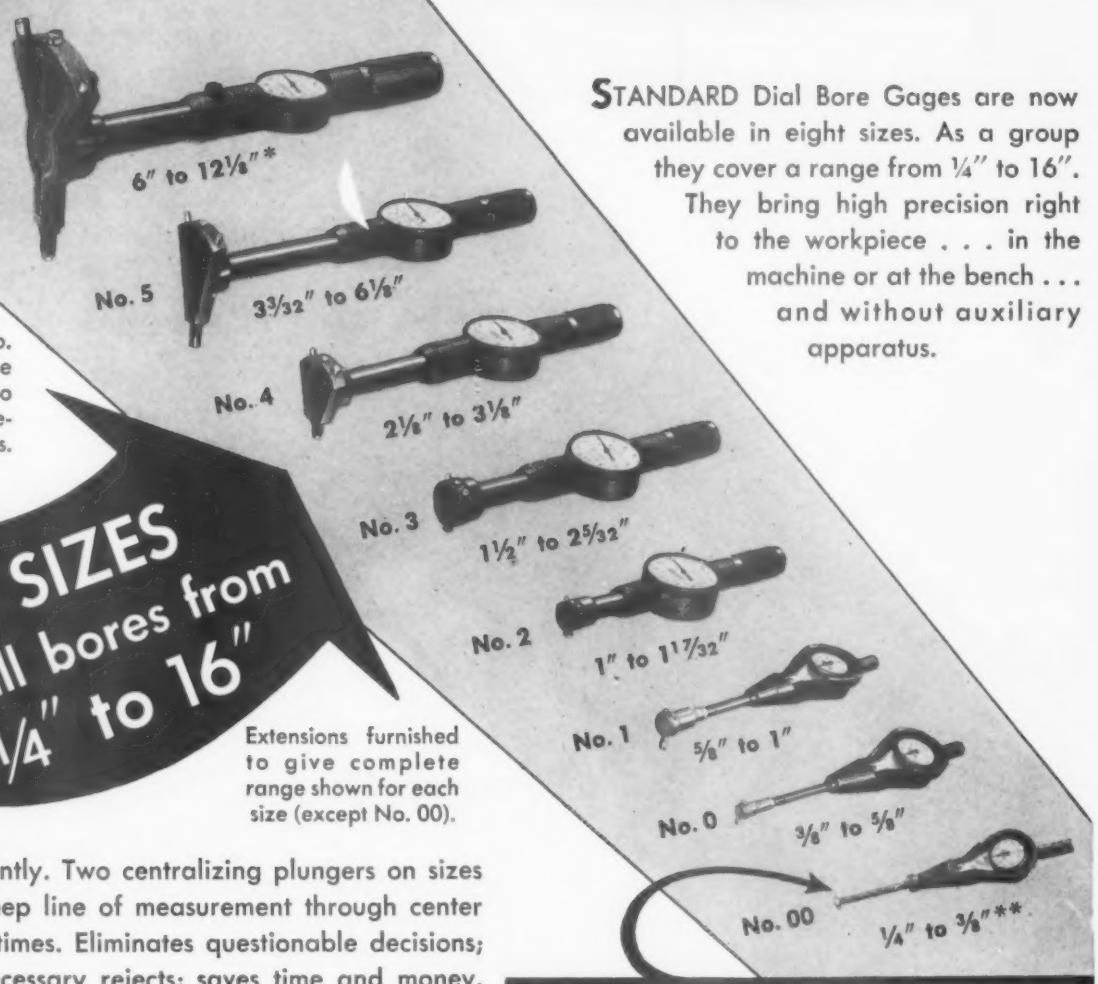
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

Now!...a Wider Range!

STANDARD DIAL BORE GAGES

for Positive, Direct, Precision Measurement



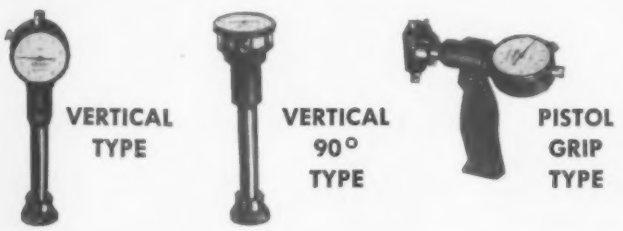
STANDARD Dial Bore Gages are now available in eight sizes. As a group they cover a range from ¼" to 16". They bring high precision right to the workpiece . . . in the machine or at the bench . . . and without auxiliary apparatus.

*Range of No. 6 Gage can be extended to 16" with special extensions.

8 SIZES for all bores from ¼" to 16"

Extensions furnished to give complete range shown for each size (except No. 00).

Repeat consistently. Two centralizing plungers on sizes 0 through 6 keep line of measurement through center of bore at all times. Eliminates questionable decisions; minimizes unnecessary rejects; saves time and money.



VERTICAL TYPE — **VERTICAL 90° TYPE** — **PISTOL GRIP TYPE**

In addition to above, special gages available for out-of-ordinary applications.

NEW!

The No. 00 Gage with Centering-size Discs for checking bores ¼" to ⅜" with tolerances up to .005"

**Regularly supplied with a centering-size disc made for dimension specified by user. Discs of other sizes may be readily interchanged. If set of discs is desired, covering complete range of ¼" to ⅜", write for information.

Patent Applied For

WRITE FOR DETAILED INFORMATION

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.


High Production Taps
You get top production, long life, and uniform tapped hole sizes from Winter Nib Taps—the taps with "Balanced Action" built into them.
WINTER BROTHERS COMPANY
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Distributors in principal cities. Branches in New York, Detroit, Chicago, San Francisco.
Division of National Twist Drill & Tool Co.
ALWAYS AT YOUR SERVICE
Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.
WINTER
WINTER

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TOOLS

Your demands for utmost performance, economy, and dependability in cutting tools are met in the complete NATIONAL line, including Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools. Each carries the NATIONAL name, long famous for sound engineering and skilled craftsmanship.

NATIONAL TWIST DRILL AND TOOL COMPANY
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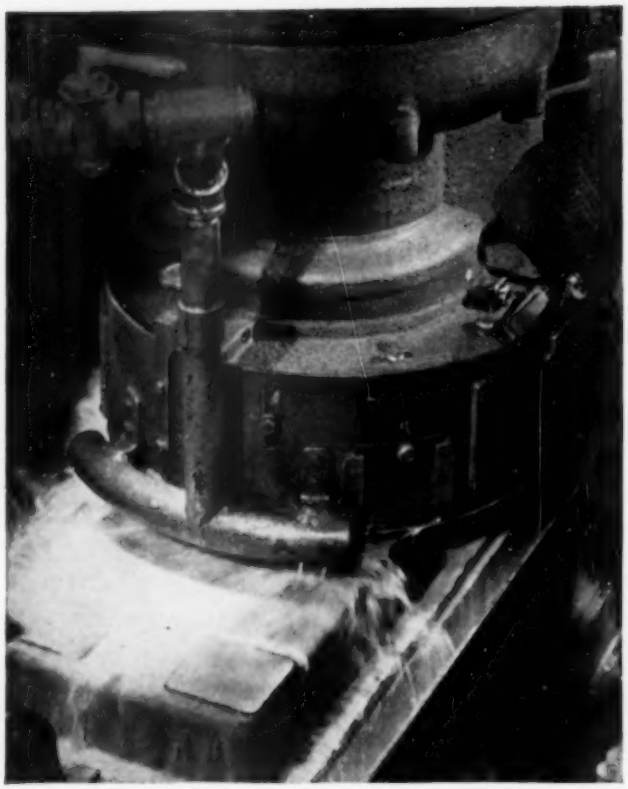
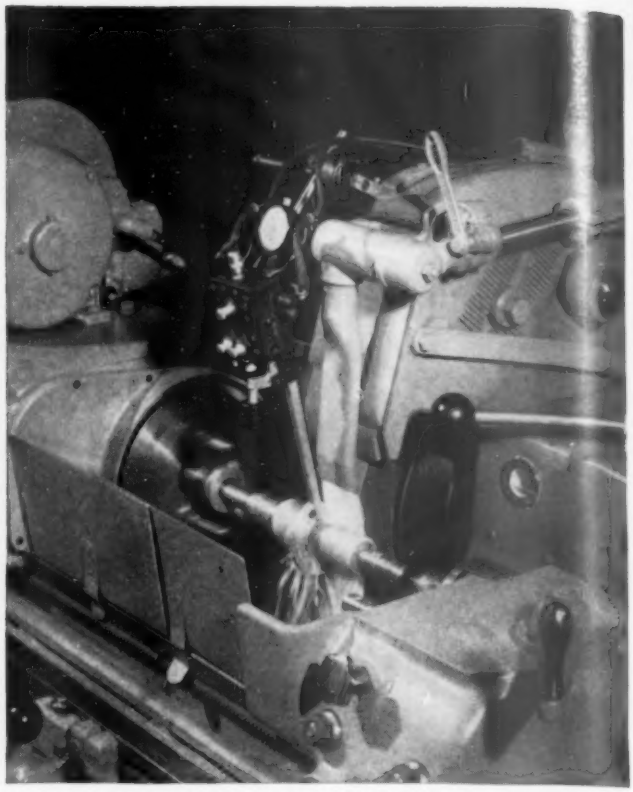
Distributors in principal cities. Factory Branches: New York, Chicago, Detroit, Dallas, San Francisco.

CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

. . . for all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools.



SURFACE GRINDING. For fast, cool cutting action Norton wheels, cylinders and segments are unbeatable. 32 or 38 ALUNDUM abrasive for hardened steels and CRYSTOLON abrasive for gray iron and non-ferrous metals.



O.D. GRINDING. Norton O.D. wheels in the abrasives, grain sizes and bonds for best results on every material are sure protection for big grinding machine investments.

NORTON BRINGS YOU

More types of abrasive products...

for More savings...on More jobs

You'll find the right answers to every one of your grinding problems in the Norton line of abrasive products. First, because it is the world's most complete line — offering you more choices than any other. Second, because Norton Research — which has chalked up an impressive list of "firsts" in abrasive development and Norton's endless field testing — make sure that every Norton abrasive product will deliver top performance on the work it is designed for.

That's the combination of variety and efficiency that will cut time, labor and costs on every grinding job you do.

SEE YOUR NORTON DISTRIBUTOR for practical help in any grinding application. He knows Norton products — what they will do and what they won't do — and you'll find that his aid in selecting the right ones for *your* jobs is a real short cut to better, lower cost grinding . . . NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

NORTON
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Making better products to make other products better

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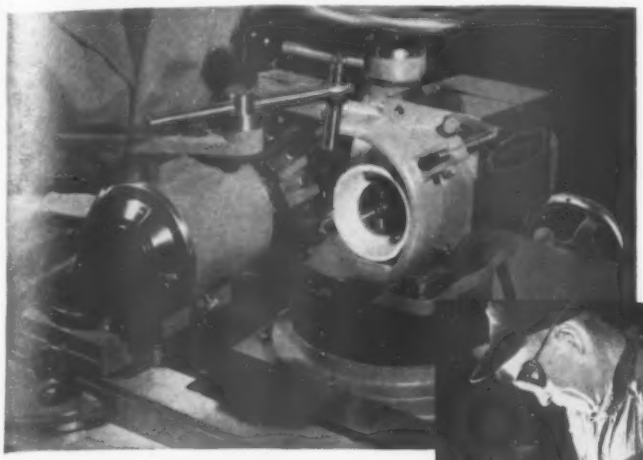
TOOL AND CUTTER GRINDING. Norton New-Process wheels have no equal for uniformity, identical wheel performance and long even wheel life. 32 ALUNDUM* abrasive for carbon and alloy steel, CRYSTOLON* abrasive for cemented carbides.



MOUNTED WHEELS AND POINTS. Hundreds of sizes and shapes for smooth-as-silk cutting action, with no bounce or vibration. Each one is trued on its own spindle to eliminate "breaking in" and to insure its running absolutely true.

POLISHING AND LAPPING. ALUNDUM grain comes in surface treatments and grain sizes for best results on every polishing job. And precise sizing makes ALUNDUM and CRYSTOLON abrasives favorites for even the fussiest lapping jobs.

ROUGH GRINDING. On swing frames, floor stands or portable grinders, Norton wheels "hug that work," to cut time and costs. And Norton *Reinforced Hub* Wheels are the safest, most versatile ever made.

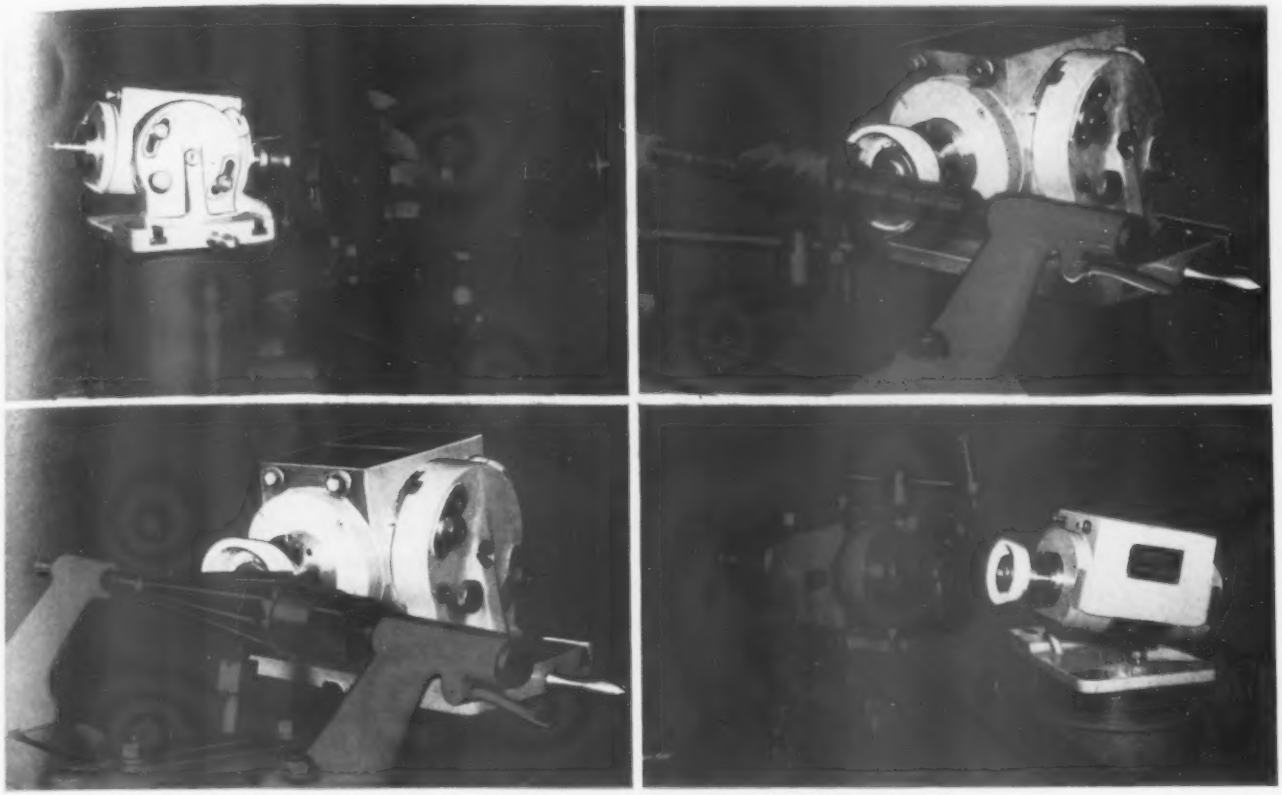
BARREL-FINISHING. ALUNDUM tumbling abrasive, being *all* aluminum oxide, cuts without glazing, and has the hardness and toughness to stand repeated use. It's the abrasive for real precision-finishing.

DISC GRINDING. Norton ALUNDUM and CRYSTOLON discs boost production and reduce down-time. They leave flat surfaces straight and smooth, with no excess heat to cause warpage.

INTERNAL GRINDING. Being identical in grinding action, Norton *New-Process* wheels can be changed without machine adjustments. That and uniform top performance make them valuable production boosters.

CUTTING-OFF. For wet or dry applications, high or low speeds, on any material, there's a Norton wheel in ALUNDUM or CRYSTOLON abrasive that's "made to order" for fast, economical cutting off.

LOOK AT THE NEW AND BETTER WAY TO GRIND TOOLS



THE NEW POPE SUPER PRECISION
1 HP, 3600 RPM MOTORIZED TOOL AND CUTTER GRINDER HEAD

With Angular Adjustment In A Vertical Plane

Specify this new and better motorized Spindle on your next tool and cutter grinder.

Replace less effective, less versatile heads on your present grinders.

This totally enclosed POPE Spindle with sealed-in lubrication has the radial and axial rigidity to make wheels cut faster — spark out quicker.

It produces the kind of cutting edge on your tools that stands up and cuts longer.

It is easy to install.

It reduces set-up time.

It reduces grinding time.

Ask us for a quotation

No. 89

POPE

TRADE MARK REG. U.S. PAT. OFF.

POPE MACHINERY CORPORATION

ESTABLISHED 1920

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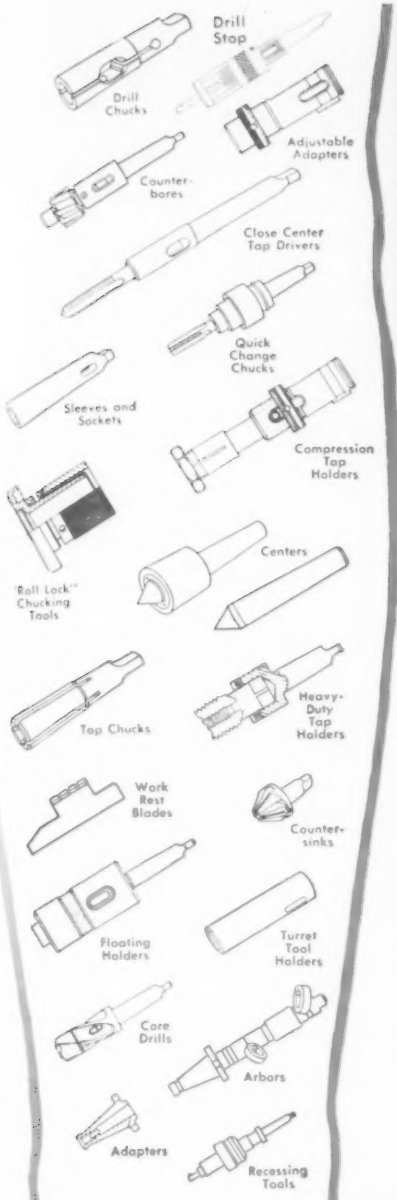
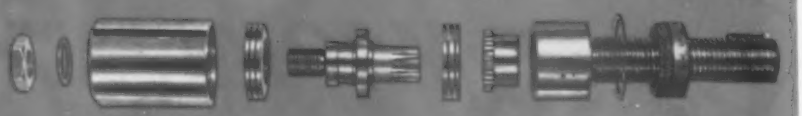
BUILDERS OF PRECISION SPINDLES



the "ARMS and HANDS" for your MACHINE TOOLS

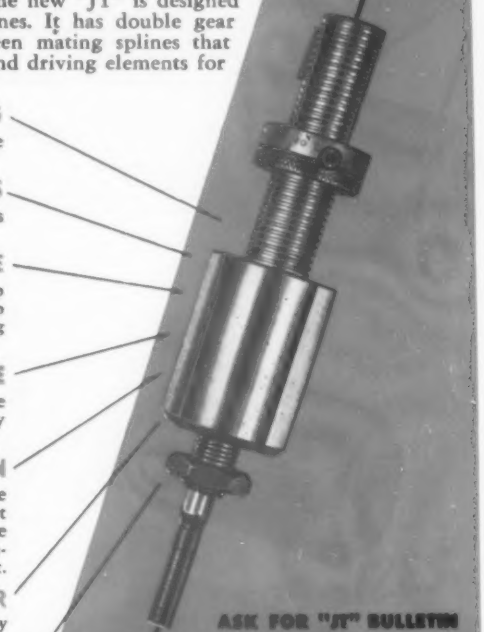
If you think of a Lathe, Mill, Multi-Spindle Machine, or other Machine Tools as being a human body, supplying power to the parts of the body doing the actual work, then Scully-Jones tools represent the "Arms and Hands"

FOR MULTIPLE SPINDLE MACHINES



NEW SJ SCULLY-JONES "JT" FLOATING TAP HOLDER

Comparable to the "JA" Floating Holder, which has thoroughly proven itself in the field, the new "JT" is designed for use in multiple spindle machines. It has double gear spline drive, with clearance between mating splines that allows free movement of floating and driving elements for uniform tapping operations.



LESS OVERHANG

The short projection requires less space between spindle and work.

WORK ON CLOSE CENTERS

Small body diameter permits operations on close centers.

REDUCES TAP DAMAGE

Collet is split on 4 sides; centers tap by the shank, reducing strain and tap damage. Thrust bearings permit cutting tools to float freely into alignment.

SHORTENS SET-UP TIME

Quick-Lock Nut Locks any place on the threaded adapter shank, making it easy to adjust for depth.

TROUBLE-FREE OPERATION

Balls, in the 2 thrust bearings, are free to move or rotate around the collet because they are separated from the drive. This reduces destructive scrubbing action which prevents free float.

REDUCES WEAR

Wear of floating elements is practically eliminated, due to positive lubrication of all parts during operation.

SHUTS OUT DIRT

Outer shell with its "O" ring is a perfect seal to retain lubricant and keep out chips and dirt.

ASK FOR "JT" BULLETIN

Scully-Jones AND COMPANY

1910 So. Rockwell St., Chicago 8, Ill.

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

YOUR PROBLEMS ARE OUR PROBLEMS

Helping you solve your tooling and production problems is Scully-Jones first objective. Ever since 1912 we have designed, developed and manufactured tools to the highest standards to help you get fast, accurate production at low cost.

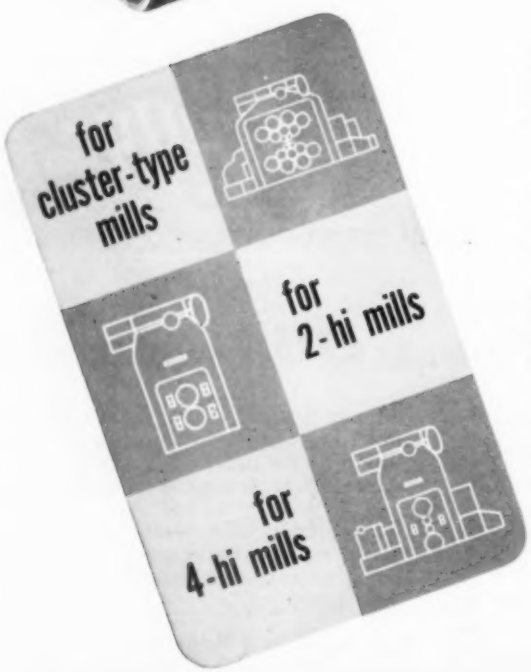
That is why you can purchase S-J Tools and get the best that engineering research, modern equipment, correct materials and expert workmanship can produce.

Use these S-J "Arms and Hands" to equip your machine tools. They will help you get low cost, fast, accurate production on such operations as drilling, reaming, tapping, milling, counterboring, countersinking, core drilling, recessing or undercutting, boring and grinding.

For current information on S-J Tools, refer to Catalog 600. Write on your company letterhead for your copy.

Let us help you solve your tooling and production problems. Because our manufacturing facilities have been expanded, we're in a position to give you reasonable deliveries. For quick service see our nearest representative or contact Scully-Jones direct.

WORK ROLLS WITH THE *MAGIC* TOUCH . . .



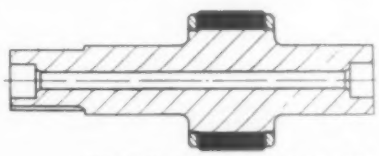
● Here's the magic key to improved surface finish, more uniform gauge and closer tolerance on all types of cold-rolled metal strip. Whether you require an ultra-mirror finish or just a plain, smooth surface—work rolls of Talide (Tungsten Carbide) are the answer. Only Metal Carbides has the know-how and experience to produce carbide rolls from 1 pound laboratory size up to 1,000 pound production mill rolls.

Long-lasting Talide Rolls, made of the world's hardest metal, step up mill production and reduce scrap and rejects. They last 25 to 50 times longer between grinds, and can be reground twice as many times as ordinary rolls. They impart improved physical properties to the strip, reduce plating costs, and eliminate the need for subsequent polishing operations.

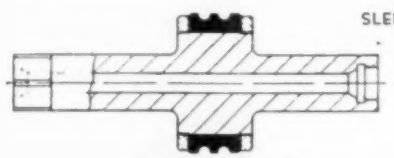
Over 50 mills are now using Talide Rolls for rolling cold-rolled, copper, brass, stainless, spring steel, razor steel, alloys, carbons, aluminum foil, tinsel ribbon, flat and shape wire.

Talide Rolls are designed to help the metalworking industry produce more efficiently—in less time—at lower cost.

Send for Catalog CR-50



SLEEVED ROLLS FOR FLAT WIRE



FOR SHAPE WIRE

METAL CARBIDES CORPORATION
TALIDE MC
YOUNGSTOWN, OHIO.

METAL CARBIDES CORPORATION

YOUNGSTOWN 7, OHIO

SINTERED CARBIDES • HOT PRESSED CARBIDES
CUTTING TOOLS • DRAWING DIES • WEAR RESISTANT PARTS

OVER 25 YEARS EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

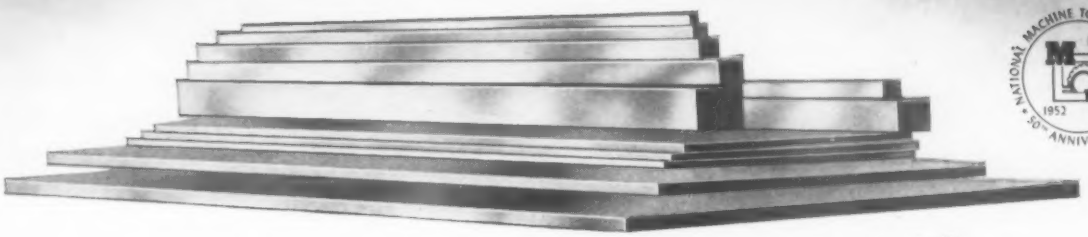
GET UP TO 50% MORE PIECES

from punches and dies made with . . .

Starrett No. 497

AIR HARDENING

PRECISION GROUND DIE STOCK



NATIONAL MACHINE TOOL BUILDERS' ASSN. 1902 1952 50th ANNIVERSARY

UP TO 50% MORE PIECES PER SHARPENING! That is what you'll get with punches and dies made from the new Starrett No. 497 *Air Hardening* Precision Ground Die Stock. 5% chromium content plus a special analysis to insure good hardening properties makes it highly wear resistant — ideal for long run production dies and punches and for stamping silicon, stainless steel, Monel and other abrasive materials. Also for thread roller dies, rolls, master hubs, precision tools, gages, large blanking dies, long punches, trimming dies, forming dies, coining dies, machine parts and other precision pieces.

New Starrett *Air Hardening* Die Stock is non-deforming . . . no distortion, no cracking, no costly rejects, less finish grinding. It's fully spheroidized annealed for easy machining with a wide hardening range for foolproof heat treating. Order a supply today through your distributor. He'll give you prompt, dependable, quality service.

"JUST LAY IT OUT . . . AND SAW IT OUT"

For best results use Starrett Band Saws

NOW—

4 TYPES—295 SIZES

NO. 497 AIR HARDENING (Non-Deforming)

NO. 496 OIL HARDENING (Non-Deforming)

NO. 495 OIL OR WATER HARDENING

NO. 495 WATER HARDENING

Flat stock in 18" lengths, die stock in 36" lengths. Thicknesses from 1/64" to 3" — widths from 1/8" to 14". Each piece marked for size and type and packaged in protective envelope.

NEW FOLDER and WALL CHART lists all sizes plus formulas for air, oil and water hardening. Write for it. Address Dept. E

STARRETT TOOLS

TRADE MARK **Starrett** REG. U.S. PAT. OFF.

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

THE L. S. STARRETT COMPANY
Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR

Prompt delivery
Dependable service
Quality products

DANLY SPECIAL DIE SETS

Completed die for blanking a Nash door component—built for longer die life in a Danly all steel 4-post special die set.

Danly all steel 4-post special die set, 14" x 44".

help Nash meet close production schedules!

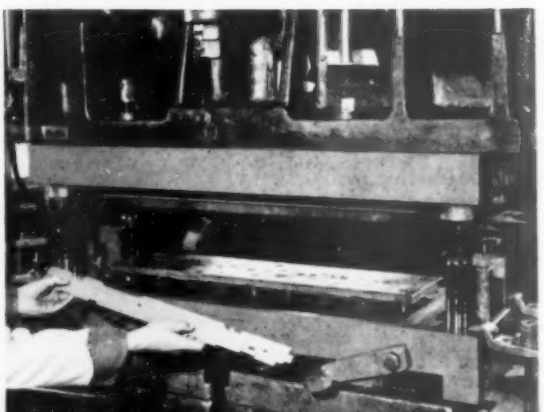
Dies play a big part in modern high-speed automobile production. They have to be ready on time when model changes are scheduled and they have to stand up under three-shift operation day in and day out with a minimum of down time. That's why you'll find so many Nash production dies built in Danly Special Die Sets. A Danly set means fast delivery to meet the tooling schedule and a rugged, precise base for the dies that assures maximum die life.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue • Chicago 50, Illinois

DANLY SPECIAL DIE SET SERVICE IS FAST AND CONVENIENT —CALL YOUR NEAREST DANLY BRANCH

***CHICAGO**	50	2100 South Laramie Avenue
***CLEVELAND**	14	1550 East 33rd Street
***DAYTON**	7	3196 Delphos Avenue
***DETROIT**	16	1549 Temple Avenue
***GRAND RAPIDS**		113 Michigan Street N.W.
INDIANAPOLIS	4	5 West 10th Street
***LONG ISLAND CITY**	1	47-28 37th Street
***LOS ANGELES**	54	Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE	2	111 East Wisconsin Avenue
***PHILADELPHIA**	40	511 W. Courtland Street
***ROCHESTER**	6	33 Rutter Street

*Indicates complete stock



View of die shown above mounted in 150 ton press at the Seaman Body Plant of the Nash Kelvinator Corporation in Milwaukee, Wisconsin.

DANLY®

DIE SETS . . . STANDARD OR SPECIAL
DIEMAKERS' SUPPLIES

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to machine shops, we hope some of these interesting ideas, culled from thousands of jobs, will suggest ways to help you cut time and costs in your own metal work.

COST-SAVING SETUP FOR MACHINING BOTH ENDS AT ONCE

Shows Value of Proper Tool Planning with Versatile Lathe

You can see real thinking has gone into this setup for machining tractor rear axle housings. As the result, this Simplimatic Automatic Lathe is simultaneously machining the two end flanges in a single, fast operation.

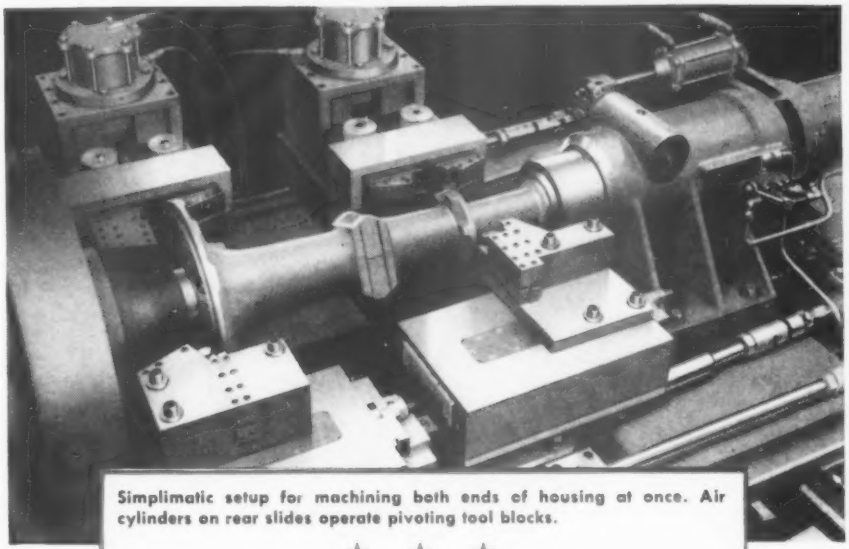
Work is divided between the four slides. All turning and some chamfering are done by the two front slides. The two rear slides take care of the straddle facing . . . doing it in an extremely clever way. Each of these rear slides consists of a pair of pivoted tool blocks which have a scissors-like action.

Tool Blocks have Two Sections

The two *right* rear tool blocks are tightly wedged together at the start of the cut. When straddle facing is completed they spring apart, providing tool relief for the withdrawal.

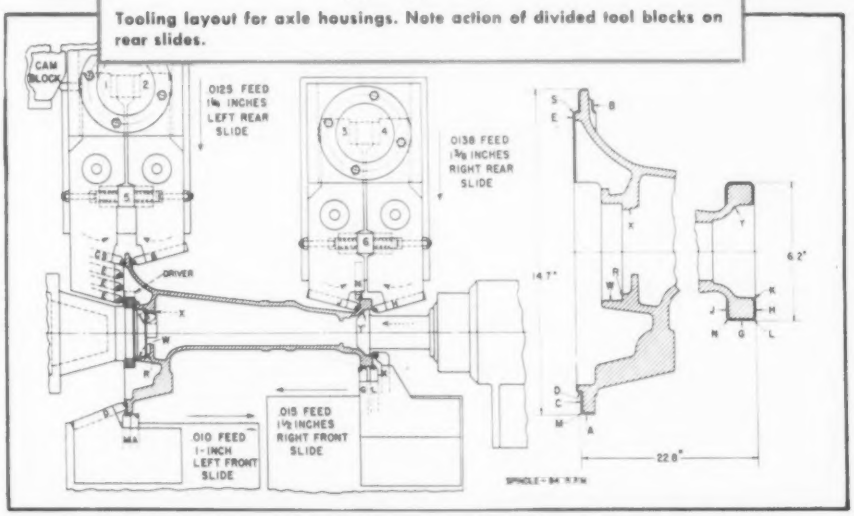
There's a different action to the two *left* rear tool blocks. Here, the tool blocks are partially wedged together as the slide feeds the tools into the work. As the slide continues to feed forward, the straddle facing tools are brought closer together. This splits the wide facing cut among three tools. At the completion of the cut, the tools spring apart for tool relief. Floor-to-floor time for the entire automatic operation is 1.33 minutes.

Pivoting tool blocks on this Simplimatic job provide the answer for machining both flanges in a single operation.



Simplimatic setup for machining both ends of housing at once. Air cylinders on rear slides operate pivoting tool blocks.

★ ★ ★



Tooling layout for axle housings. Note action of divided tool blocks on rear slides.

Other interesting jobs . . . handled on the Simplimatic Automatic Lathe, plus full information and specifications are yours in the all new Simplimatic catalog just off the press. Ask for your copy.

GISHOLT

TIME-SAVING IDEAS

AUTOMATIC LATHE TURNS OUT PARTS IN PAIRS

Tooling Arranged for Handling Related Parts with One Setup

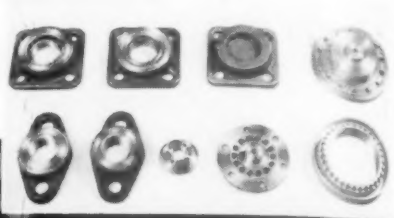
Here's a 1F Fastermatic Automatic Turret Lathe specializing in the production of a wide assortment of mating parts. The steel forgings are handled in lots of 200 pieces—100 male and 100 female parts.

Simple tooling takes care of the simple operations involved. Just two faces of the hexagon turret are needed for each part . . . but the handling of alternate male and female parts keeps four turret stations busy.

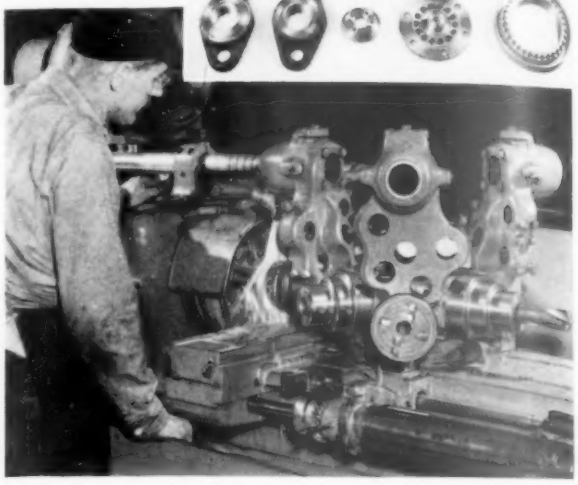
The photo shows a male flange being formed. This is followed by a drilling operation. After that, the operator removes the male flange and chucks a female flange (using same chuck jaws). Passing the next turret face, work is then begun on this flange. From stations four and five the female flange is drilled and faced. Turret station six is then passed and the operation is complete . . . and a male flange is again handled.

The nice feature of this setup is that with one set of tools on the machine, you complete *two* mating parts. This way you're always sure the parts will match perfectly. Moreover, since alternate pieces are machined, there's no problem in keeping quantities even. Total time for a pair of these parts is an even 5 minutes.

Typical parts handled in pairs on the Fastermatic



Small parts, even in small lots, are economically produced in pairs by the Fastermatic Automatic Lathe.



Male flange being formed. After next drilling operation, female flange is machined. Then male flange again.

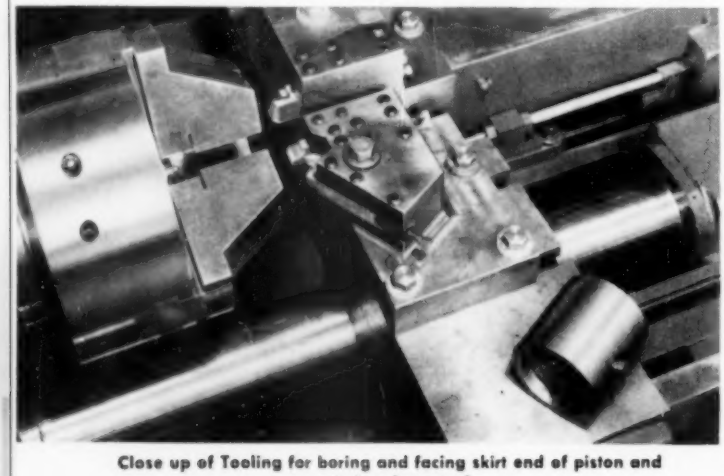
PISTONS BORED AND CENTERED IN 1ST OPERATION

No. 12 Hydraulic Automatic Lathe Combines Machining of Skirt and Centering of Dome

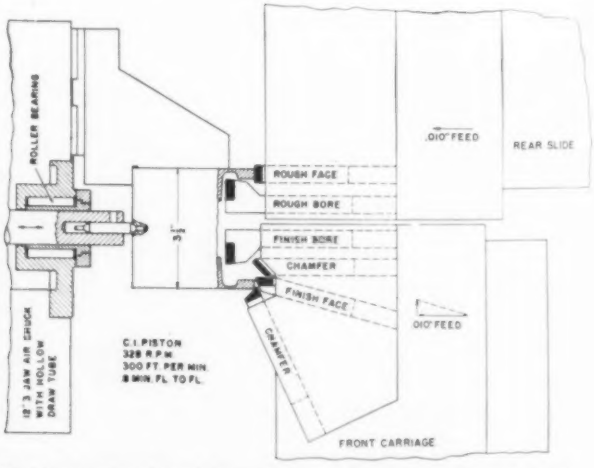
The main operations are on the skirt end of this cast iron tractor piston. The rear slide feeding longitudinally rough bores and faces the skirt. As this slide withdraws, the front carriage moves longitudinally to finish bore and chamfer the ID. It then swings in to finish face and chamfer the OD. It is then withdrawn from the position to provide tool relief.

After operations on the piston skirt, the No. 12 Hydraulic completes its job by centering the piston dome. This is handled by the back boring attachment in the spindle. Floor to floor time is .8 minute. Several sizes of pistons are handled by this No. 12 Hydraulic, all with fully automatic operation.

Combining boring of skirt and centering of dome saves time and provides complete concentricity for following machining operations.



Close up of Tooling for boring and facing skirt end of piston and centering dome end.



Cast iron tractor piston job on the No. 12 Hydraulic Automatic Lathe.

GISHOLT

LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT

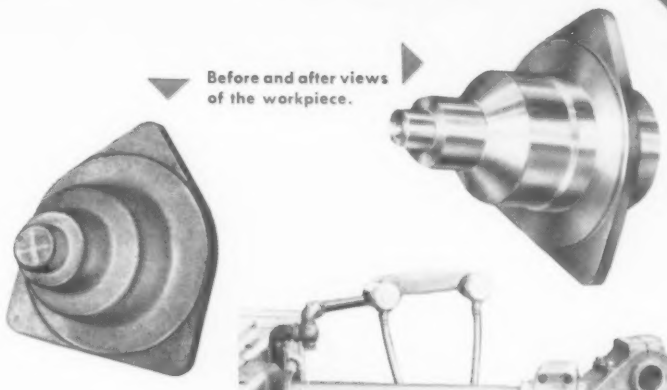
GISHOLT

TIME-SAVING IDEAS

EASY DOES IT...WITH A 6-SPEED CHANGE OF PACE

Saddle Type Turret Lathe Cuts Time Lag with Speed Selector

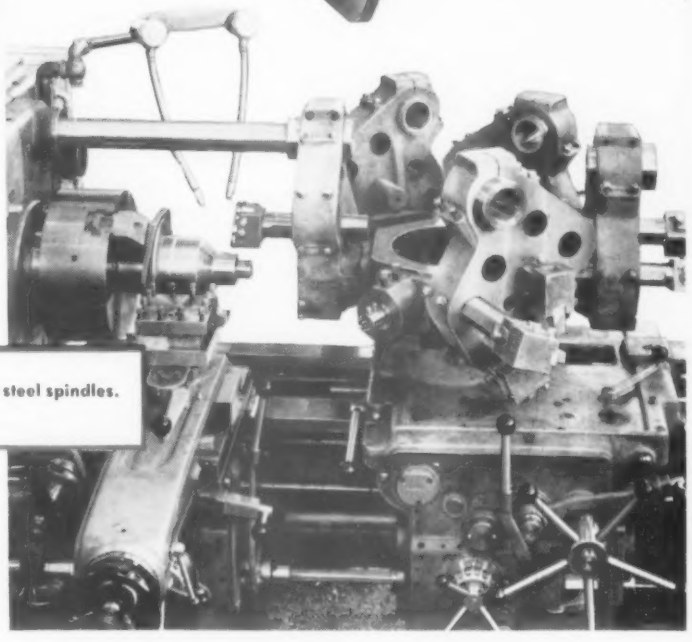
Before and after views of the workpiece.



While the operations needed to finish these spindles are all relatively simple, the job could be a trouble-maker on a less able machine than this 2L Saddle Type Turret Lathe.

Here's why: The part's a tough steel forging weighing in at 103 lbs. and finishing at 93 lbs. Not much stock removed, to be sure, but it takes carbide to do it. The workpiece is chucked on the previously turned short rear hub with a standard 3-jaw airchuck to speed up handling. Standard tools are used to finish all twelve outside diameters.

With the many diameters to be machined on the part, six different spindle speeds are required . . . an easy matter for the Gisholt with its Hydraulic Speed Selector which gives instant, accurate speed changes. Floor-to-floor time for these husky parts is an easy 14.5 minutes.



Setup for machining alloy steel spindles. 2L Saddle Type Lathe.

Simple operations on these parts are made even simpler for the operator because of the ease of changing spindle speeds with the Gisholt Hydraulic Speed Selector.

A LITTLE EXTRA TOOLING—A LOT OF EXTRA PRODUCTION

Ram Type Turret Lathe Completes Pulleys in Single Chucking

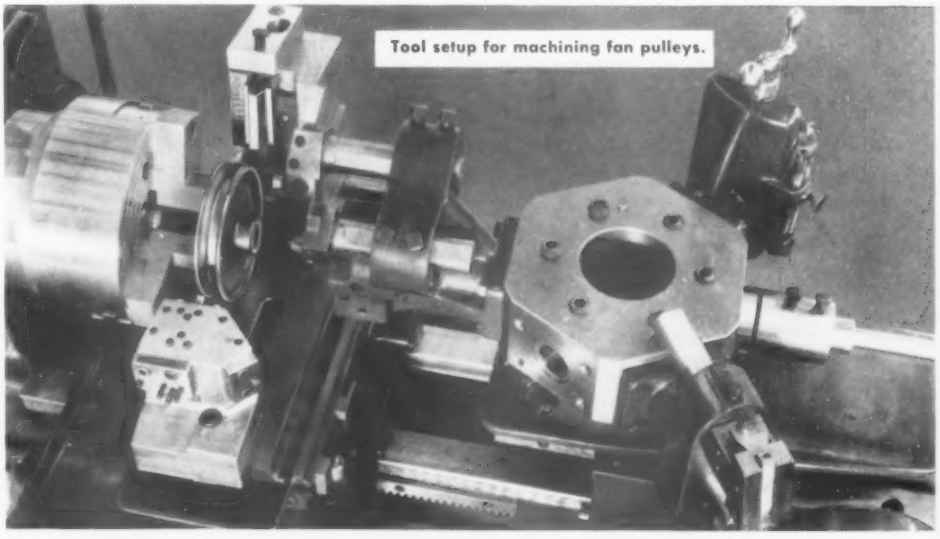
Here's another example of where careful attention to tooling is paying off in increased production. The part is a V-belt pulley and the machine is a standard No. 3 Ram Type Turret Lathe.

The part is held in special top jaws on a standard Gisholt 3-jaw scroll chuck. All boring, turning and facing of the hub are handled by multiple tooling on three faces of the hexagon turret. The large OD is also turned from here.

Special tools are used on the cross slide. In place of the standard quick-indexing tool post on the front of the slide, there is a special tool block. These tools not only rough out the groove, but straddle face the sides as well.

On the rear of the cross slide is another special tool block. Tools here finish-form the groove and finish-straddle face the flanges.

By using special tool blocks on both the front and rear of the cross slide, all machining on these pulleys is done in one chucking.



Tool setup for machining fan pulleys.

GISHOLT

TIME-SAVING IDEAS

TAKING THE TROUBLE OUT OF TAPPETS ... WITH SUPERFINISH

9 Spindle Superfinisher Does High Volume Work

Here's another forward step for extending and improving engine performance. This time it's valve tappets that are being Superfinished. Doing this high production job is a Model 53A Superfinisher. Here's how it operates:

The machine has nine spindles in a rotating base. This operates continuously, like a "merry-go-round." Each work spindle has a collet to hold the tappet. Above is a Superfinishing head. Collets and heads rotate in opposite directions. During the machine cycle the flat Superfinishing stones scrub off the amorphous metal on the cam surface of each tappet.

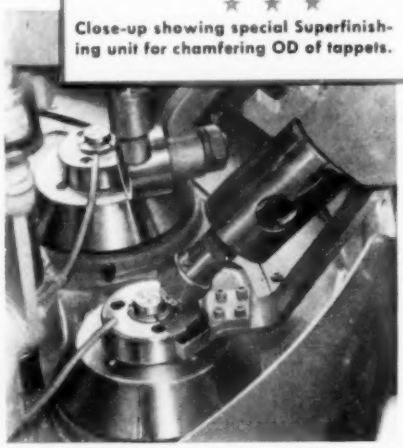
Superfinishing complete, the head is raised and an angular head comes in to chamfer the corners. Then, as the spindle returns to the unloading position, rotating stops, the collet opens, and the tappet is partially ejected. The operator then takes out the finished tappet and replaces it with an unfinished tappet. Production is 600 to 800 parts per hour.

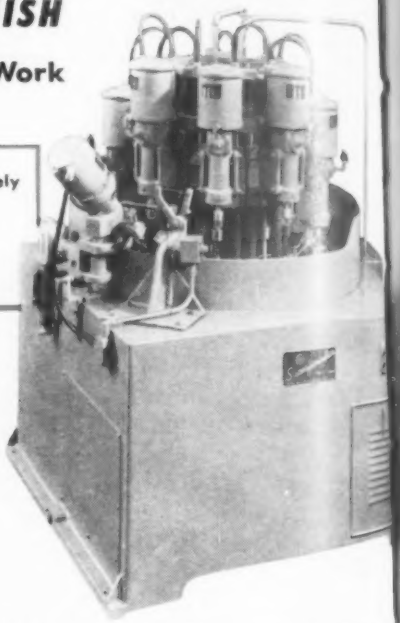
Superfinishing is solving "wearing" problems in many industries.

Superfinisher produces 600 to 800 finely finished valve tappets per hour.

★ ★ ★

Close-up showing special Superfinishing unit for chamfering OD of tappets.





The textbook *"Wear and Surface Finish"* gives the complete story. Ask for your copy.

Better, longer lasting valve tappets are produced in this high production Superfinishing setup.

FLYWHEELS IN ALL SIZES BALANCED ON THIS ONE MACHINE

Handled on Efficient Production Basis

Here is the way flywheels in a large variety of sizes are balanced by a well known engine manufacturer. A Gisholt DYNETRIC Type UV1 Balancing Machine takes care of all production, with parts weighing from 25 to 400 lbs.

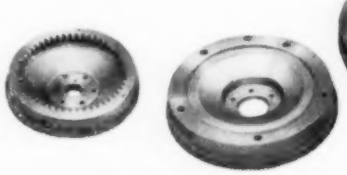
A roller and guide arrangement, adjustable to handle flywheels from 8½" to 32", carries the flywheels from the assembly line to the machine and back. As the flywheel is located in position on the Balancer, a hydraulically operated mechanism raises it from the rollers for support by the spindle.

After the quick balancing operation is completed, the flywheel is turned to the indicated angle of unbalance. A sliding prick-punch, which can be set at any radius from 4" to 16" from true center, is then moved to the proper location and activated to mark the spot on the flywheel bottom where drilling correction is made.

This balancing operation, which is part of assembly line operations, results in smoother engine performance, less engine vibration.

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

Type UV1 Balancer for balancing tractor engine flywheels.



A few of the many sizes of flywheels balanced.

No 11-1252

603

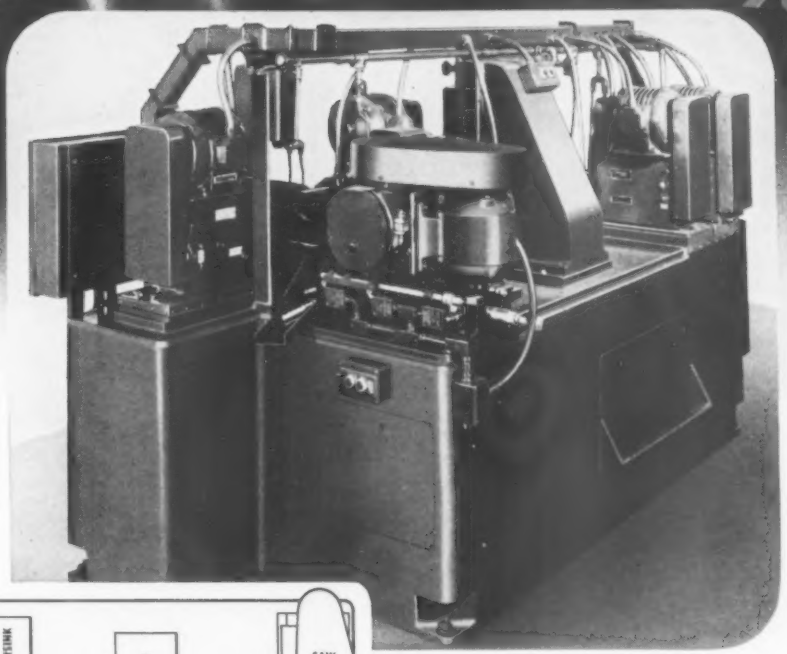
THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

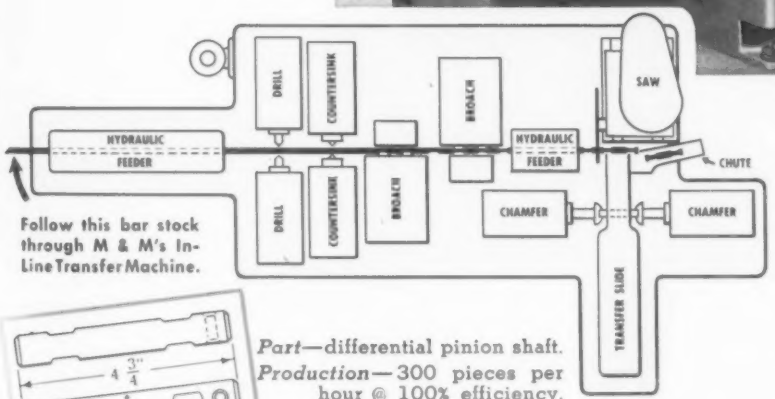
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

MP/SF

Most Production per Square Foot



Typical M & M progressive IN-LINE automatic transfer machine.



Follow this bar stock through M & M's In-Line Transfer Machine.

Part—differential pinion shaft.
Production—300 pieces per hour @ 100% efficiency.

Motch & Merryweather's forward-looking design *unitizes* a number of operations in the same machine. You obtain maximum usable production per square foot of floor space. Furthermore, you effect the greatest possible savings in time, overhead and operating costs.

Manufactured by —THE MOTCH & MERRYWEATHER MACHINERY CO.—
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To help you in this reappraisal, there's nobody so thoroughly equipped as the CARBORUNDUM man or distributor salesman. He's the only man who can recommend without bias, because he's the only man with a complete line of branded abrasives to meet every need you have. That's why he can match his product to your method—doesn't have to persuade you to change your method to match his product.

His experienced counsel is yours to command—backed up by the product quality which has made CARBORUNDUM the best-known brand name in abrasives throughout the world. Call him in today—it's to your profit!

Here are only a few of the 30,000 reasons why you get the RIGHT combination of abrasive and method only from CARBORUNDUM

RUNDUM

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offers ALL abrasive products...to give you the proper ONE

Each of these Sundstrand Lathes has these Modern Production Features

4 MODELS COVER HP RANGE OF 3 TO 75 HP . . .

Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work.

Speeds

Spindle speed range ratios have been increased to 30 to 1 to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

Feeds

A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The New Models 4A, 8A and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

Carriage Adjustments

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

Simple, Fast Set-up

Convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds is provided. Feed and speed chart and pick-off gear storage compartment are readily accessible for quick set-up or changeover.

Cycle Changeover

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

Automatic De-clutching

All new models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long, tool life.

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 7½ HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 60 to 1800 RPM	30 to 900 RPM 40 to 1200 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5" 8¾" 275"	 6" 12½" 250"	 8" 15¼" 250"	 12" 17" 250"
REAR SLIDE: Max. Stroke	4"	5½"	6½"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60".	24, 36, 48 & 60"	36, 60 & 84"

Additional Data . . .

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 ranging from 3 to 75 HP. Write for complete information on these new machines today. Ask for bulletin 725

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2540 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

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Take End Mills, for instance. What do *you* need? Here are all types of short or standard mills, single or double-end. Also, types with left-hand spiral but right-hand cut to push chips ahead . . . ball-end for die cavities, fillets, and round-bottomed holes or slots. Here are two lip styles with single or double-end, for plunge-cutting. Here are taper shank styles you can use direct in machine spindles. And here's the old reliable shell design, for face or slab milling. Not to mention a wide range of lengths in Morse's exclusive Hi-Helix shear-cutting design.

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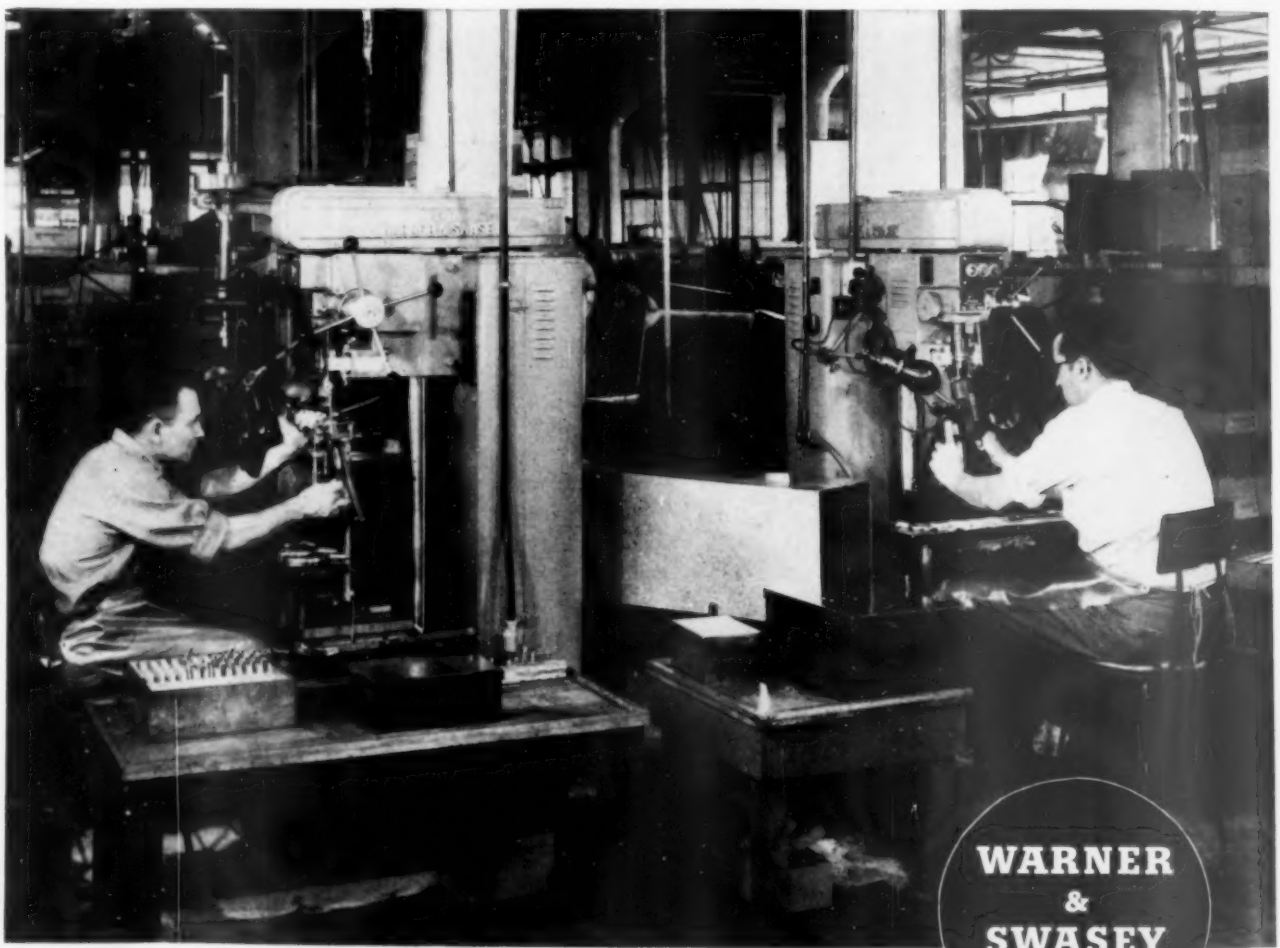
A "make or break" operation

VERY OFTEN when a part reaches a Warner & Swasey Precision Tapping and Threading Machine, nearly all the required machining has been done. Now all that remains is accurate tapping to proper depth, and the piece is ready for inspection and shipment, or further assembly.

Most of these are precision jobs that must meet Class 3 fits or better. In blind holes, uniform depth tolerances must be maintained. Inaccuracies now would mean a reject of the piece, and the loss of all the previous time-taking machining operations.

It is because these final tapping or threading operations *are* such "make or break" operations that more and more manufacturers are turning to Warner & Swasey Precision Tapping and Threading Machines. Warner & Swasey's positive lead screw principle, with solenoid-actuated guide fingers to lead the tap in and out of the work, reproduces the accuracy of the tap itself — eliminates any chance of thread inaccuracies caused by drag or backlash.

Where your schedules demand precision tapping on a production scale, call in our Field Engineer and have him show you how a Warner & Swasey can help you speed up your production.



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YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY TURRET LATHES, AUTOMATICS AND TAPPING MACHINES

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SELECTION OF
MATERIALS,
MANUFACTURE AND
INSPECTION

that can contribute to

PRECISION PERFORMANCE and CONVENIENT OPERATION

in the Modern Tool Room

HAS BEEN
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MODEL "C"

Lathes

12", 14" and 16" Sizes

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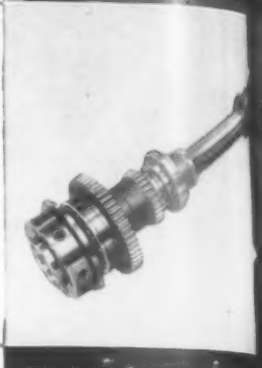
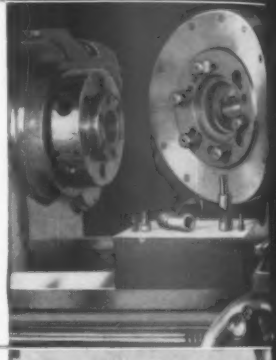
FLAME-HARDENED AND PRECISION-GROUND BED WAYS are constructed of specially selected materials processed by exclusive P&W methods. Automatic lubrication from a reservoir in the carriage is provided. The result is great resistance to wear, permanent stability and a high initial accuracy indefinitely retained.

SUPER-PRECISION SPINDLE is mounted at the front end in two preloaded precision bearings and at the rear end in anti-friction type needle bearings.



HEADSTOCK GEARS of hardened and ground alloy steel are accurate in tooth form and spacing to "tenths". Multiple splined gear shafts are mounted throughout on anti-friction bearings. 18 spindle speeds in smooth geometrical progression are provided.

CAM-LOCK SPINDLE NOSE is recognized by the American Standards Association as the most rigid and permanently accurate means of holding chucks and face plates to the spindle. Operation is safe and convenient; there is no danger of a chuck's freezing in place or being thrown off in high speed operation.



SEPARATE LEAD SCREW AND FEED ROD preserve the original accuracy of the machine. The lead screw is used only during actual thread cutting, and in ordinary turning operations the carriage is moved entirely by the splined feed rod. Wear that might impair precision is reduced to a minimum.

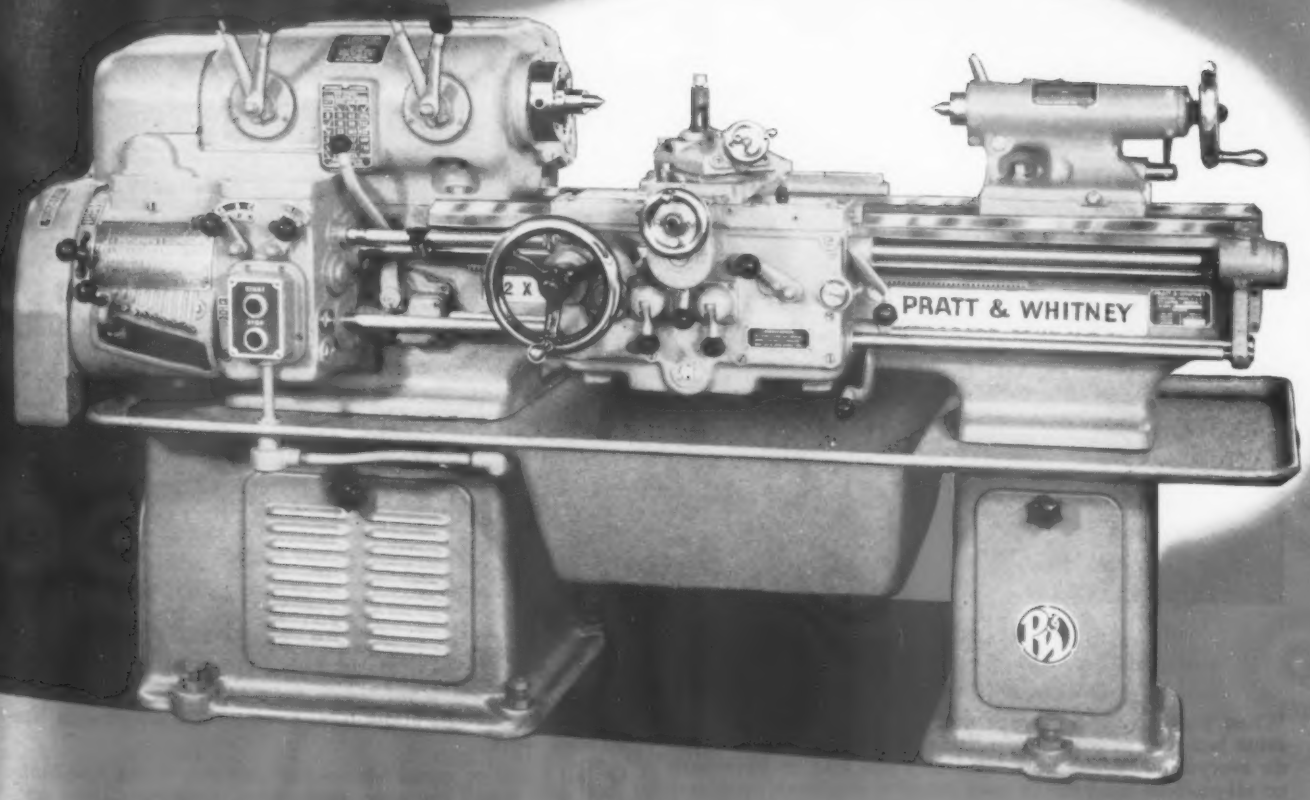
LARGE DIRECT-READING DIALS contribute to speed, accuracy and convenience in operation. The easy-to-read graduations give work diameter reductions in thousandths of an inch on the cross slide and on the compound rest.

PRATT & WHITNEY

MODEL "C"

Lathes

"THE STANDARD BY WHICH ALL FINE LATHES ARE JUDGED"



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MACHINE TOOLS • CUTTING TOOLS • GAGES

The **Tool Engineer**

Editorial

Society Passes Century Mark

With the chartering this month of the 100th chapter, ASTE has become the largest technical society in America devoted to production equipment and methods. A fitting distinction and tribute to New England where the machine tool industry had its beginning more than 150 years ago, this new Northern Massachusetts Chapter embraces the industrial areas of Greenfield, Gardner, East Templeton, Orange, Winchendon and Athol.

Also during the month, the 101st charter was granted to the Keystone Chapter for more than 90 tool engineers from Scranton, Wilkes-Barre, Carbondale, Pittston, Archbald, Kingston, Old Forge and other neighboring towns in Pennsylvania.

Not confined to any section of the country, the phenomenal growth of the Society during the past twenty years has been healthily distributed throughout all our industrial areas, including eight in Canada. This constantly increasing growth and the authority it has achieved attest to the key roll of the tool engineer in our civilian and military economy.

Keystone to the success of the Society is its facilities for providing forums for the exchange of information between members in various industries. The frankness with which production problems are discussd, the voluntary time contributed by members with production know-how, and the publication of the latest technical information not only benefit the members individually but also accelerate industrial progress. This helpful interchange of ideas is a vital and live force that provides high professional standards and stepping stones to greater achievements. As the Society provides guidance, so it will prosper. The partnership between the Society and member benefits both mutually. As one achieves recognition for a job well done so does the other increase in professional stature.

L. B. Bellamy

PRESIDENT
1952-1953

THE TOOL ENGINEER
Publication of The American Society of Tool Engineers
10700 Puritan Ave.
Detroit 21, Mich.

The Tool Engineer

Substitutions May Be Disastrous

Too often, when products have failed to meet acceptance tests, the cause has been traced finally to an innocent substitution of a more available or seemingly better material for a certain part. This has happened more frequently than many companies care to admit, especially when the "obvious" trouble was located only after endless analysis and checking.

To illustrate the hazards involved, a small plant was awarded a contract for Ordnance materiel. The bid had been based on manufacturing within the design tolerances specified for the parts. Being resourceful, the manufacturer had predicated his bid upon high-speed but simple tooling. He knew that the assembled units were required to pass acceptance tests but was not aware that a materials substitution had been made after the units were designed.

As might have been suspected, shipments of parts failed to pass the Army tests. Seals in the units would not hold the maximum pressures specified. Careful checks revealed that all parts in the assemblies were within the tolerances in the specifications. Finally, the fault was traced to the substitution of a harder material for the sealing element. Much closer tolerances would be necessary if the seals were to function properly.

Faced with this information, the tool engineers realized that more elaborate tooling would be necessary to meet acceptance tests. In fact, it would bankrupt the company. Fortunately the Ordnance district appreciated the predicament and made an equitable adjustment for manufacture with the harder seals. This decision had a happy ending: Both user and producer received what each needed. Now this same manufacturer is listed by the Ordnance, not as a supplier who failed to produce, but as one of the best producers in the district. Many cases of subtle substitutions have not turned out as happily. Whenever one is involved, checking all aspects—design, production and function—may prove decidedly worthwhile.

John W Greve

EDITOR

You bet I'm concerned about carbide segregation

... that's why I sent for this booklet

Just exactly what is carbide segregation . . . ?
Why should I worry about carbide segregation . . . ?
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Increasing Tool Life and Performance

How the Buick program controls tool quality, heat treatment, grinding and application through cooperative and educational programs

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FOR SOME TIME, it has been apparent that alloy shortages will make it necessary to conserve tools and tool materials to a greater extent than ever before. Cobalt, tantalum, tungsten, and molybdenum—in addition to being used extensively in tools—are necessary in the production of jet engine alloys. It is recognized that there will not be enough to satisfy all the needs, and government controls have already limited the use of these strategic materials.

Along with the fact that tools will be less plentiful and of poorer quality will be the greater demand caused by the difficult machining problems of defense production and the necessary use of a large amount of unskilled labor. With this complex problem of too few of the right kind of tools to do a more difficult job with less experienced machine operators, it will be necessary to accelerate all projects which may lead to more efficient tool usage.

This article will discuss some of the steps being taken by Buick to control the quality and improve the performance of tools. This program, which has been in force for some time, aids in the economical use of tools at all times, but will be of greater value in the period ahead which will make such a great demand on materials and tools.

To secure the performance from a tool demands teamwork from the many departments which have an interest in tool problems. A study of the following factors illustrates this fact.

1. The tool must be designed correctly
2. The tool must be operated at suitable speeds and feeds
3. The machine must be properly fixtured
4. The correct coolant should be applied properly
5. Tools and tool material must be purchased wisely
6. Items must be standardized as much as possible to allow the buyer the best advantage of a competitive market
7. Specifications which control quality requirements must be available
8. Inspection for conformance to dimensional and material specifications is necessary
9. The condition of the productive material must be controlled for best machinability
10. Tool heat treatment must be carefully supervised
11. Fabrication and reconditioning of tools must be of the highest quality
12. Tools must be properly handled and used in every department

Each of these factors contributes to the success or lack of success achieved with any tool. Where tools fail prematurely one or more of the departments involved must find the answer and take corrective action. A cooperative attack on the tooling problem is achieved at Buick through its tool committee.

Tool Committee: The Buick Tool Committee was organized shortly after World War II to solve some of the problems encountered with reconversion to automotive production. Tool usage was excessive and there was no apparent reason for the poor results. Lack of adequate records contributed to some of the confusion that existed. In order to secure the best experience in formulating plans, representatives of the chief departments concerned were chosen to make up the committee. These departments are: master mechanics, standards, purchasing, inspection, tool research, tool design, tool manufacturing, tool grinding and metallurgical.

The aims of this committee are to:

1. Investigate all tool materials
2. Improve the general quality of tools and tool materials in order to reduce costs
3. Focus attention on known causes of tool failures
4. Institute a more thorough quality check on commercial tools
5. Investigate the causes of tool failures and, where possible, recommend corrective changes
6. Investigate the value of more complete tool records on specific jobs
7. Investigate the tool sources in an effort to determine their ability to furnish uniform quality
8. See that work is of the highest quality whenever Buick manufactures, reworks, or sharpens tools
9. Institute an educational program on tool materials for production supervisors and workers in the proper care and use of tools

With the formation of this committee, tooling experience of more than 500 years was pooled in a cooperative effort to secure maximum tool efficiency. This group meets periodically to discuss problems and subjects such as new materials, new heat treatments, tool standardization, tool quality control, and educational programs. When additional experience is required, other Buick men are asked to attend the meetings and often experts from the tool industry are called upon for specific information.

It is believed that a tool program to be successful must include the interest and enthusiasm of management and must ultimately enlist the cooperation of machine operators and other employees who handle tools. One of the most important functions of the committee is to determine what information is required and to see that this information is distributed effectively to all interested departments.

Control of Tool Steel Quality: Buick has had an incoming inspection of tool steels for many years, using the GM tool steel standards as the criterion for quality. From the outset, inspection has included examination of samples from each incoming lot of material for soundness and surface condition plus checks on chemical analysis. *Fig.* 1 illustrates one phase of this inspection procedure. The number of rejections has been drastically reduced from 5 percent when the program was instituted to about 1 percent. The reason for this improvement can be attributed, for the most part, to the fact that Buick insisted the sources now inspect their material to meet the requirements of the GM tool standards.

Control of Carbide Quality: Although carbide tools have been used for many years, only recently has much attention been given to the control of the quality. Prior to World War II there were only scattered applications, but in reconversion and the period following there was a greater trend toward the use of carbides for replacement of high-speed steel. A survey of Buick tool applications early in 1948 showed that a great percentage of carbide tools were broken before they had a chance to wear out.

When this problem of carbide breakage was taken up by the tool committee, little information was available with regard to the application of carbide tooling. Because the material was more difficult to grind than the high-speed tools, much

Fig. 1. Acceptable quality of tool steel is determined by inspection of acid-etched samples and comparing them with standard samples.

of the responsibility for the breakage was attributed to grinding practices. At the same time, the metallurgical department found that it would be necessary to start a program on carbides that would provide information for analysis of quality of this comparatively new tool material.

Because of the poor efficiency in the application of carbide tooling, it was evident that something should be done quickly. As the first step, the committee secured a display of broken tools and ar-

ranged a meeting with representatives of the departments concerned. This display shown in *Fig.* 2 served to acquaint those who were using carbides with the fact that great waste was occurring.

It was decided that since tool sharpening practices were thought to be most responsible for broken carbides, some form of an educational program should be presented to those responsible for grinding to acquaint them with the latest information on proper grinding techniques. Arrangements were made with one of the suppliers of carbides and carbide tooling to send key supervisors concerned with the fabrication and grinding of carbide tools to a training school which is carried on by this carbide source.

This proved to be an effective means of securing the available information on carbides. The first three men who attended this school came back with enough ideas to make savings which paid for the entire expense of the training program for all supervisors concerned. It was realized at the time that this information would not become most effective until it could be presented to every supervisor and, through him, to the machine operator.

Carbide Training Program: From the beginning it was realized that the fullest benefits could not be derived from an educational program on the use and application of carbides unless such information could be passed on to the machine operators. Although much progress was made in the more effective handling of carbides in fabrication and grinding, there were still abuses after the sharpened tool left the grinding room. The operator at the machine required adequate instruction on methods of handling tools. It was necessary to emphasize the fact that dull as well as sharp tools should be handled with care. The most logical means of passing the information on to the operators is through the foreman.

Buick completed a carbide training program early in 1951 for 320 supervisors. The program was developed by the tool committee in cooperation with General Motors Institute. There were six sessions of one hour each and the program was received enthusiastically with almost perfect attendance for all sessions.

A tool manual, developed in connection with the training program, was distributed to all who attended the sessions and to other members of management who have an interest in tools. It was designed as a means of maintaining a summary of the carbide training sessions, to provide general information pertinent to the fabrication, application, and handling of tools, and to serve as a place to assemble data developed in the future.

As a further step in securing cooperation, an operator's instruction card was developed for distribution to machine operators. This general information, contained on a durable card, serves as a continuous reminder to the operators that tools must be handled with care.

In conjunction with the training program, other steps such as Zyglo inspection of incoming tools and Zyglo inspection before and after sharpening indicated that a great many of the difficulties encountered were caused by poor brazing or a combination of poor brazing and grinding. Along with these improvements in brazing, the extensive application of mechanical holding devices did much to eliminate tool breakage. *Fig.* 3 is a photograph illustrating a brazed tool and a solid insert tool.

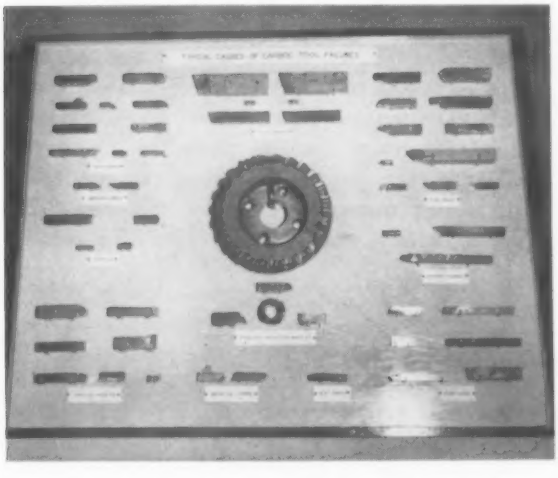


Fig. 2. Educational program utilizes display showing typical causes of carbide tool failures. Illustrated are poor tool design, improper carbide material, overrun tools, careless handling, defective carbide, defective production material, poor brazing, improper holding, and poor grinding.

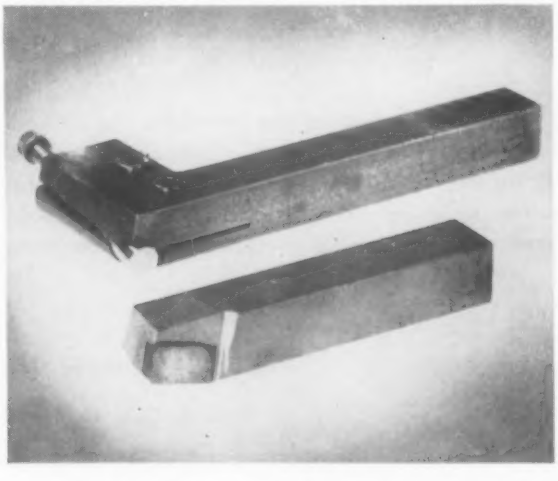


Fig. 3. Typical brazed tip tool and solid insert tool used for general production.

DIAMOND WHEELS: One of the problems encoun-

tered with the introduction of carbide tooling is the use of diamond grinding wheels. Information was lacking on such basic considerations as cutting speeds, feeds, and whether the wheels should be used wet or dry. Tests from a supplier of diamond wheels indicated that one wheel grinding wet could do approximately the same amount of work as four wheels grinding dry. It was also found that the correct grinding speed was somewhat in doubt. In addition, the effect on the wheel when the different grades of carbides were sharpened was not known. Using this information and the results of other investigations, the cost of diamond wheels has been reduced considerably. Most of this saving can be attributed to the more efficient use of existing wheels.

It is felt that greater savings can and will be realized as more information becomes available. One of the greatest abuses in the application of diamond wheels is the attempt to use them on old equipment which is not designed for the proper application of coolant. Carbides will be used in an increasing number of applications and unless the application of coolant is improved, there will be a great waste in the use of diamond wheels. The misapplication of diamond wheels may cause a further waste in the damaging of carbide tools.

A poster program was initiated this year as a further step in providing information to the machine operators. Posters called "Buick Tool Tips" are posted at all tool crib service windows and changed at periodic intervals.

Acceptance Testing for Carbide: The method being used at Buick for testing incoming shipments of tungsten carbide insert tools is based on the following properties of the carbide materials: hardness, specific gravity, microstructure, grain size, porosity, transverse rupture strength and chemical composition. Tests are made mainly for the purpose of determining if the proper grades of carbide are being received. In this manner the wrong grade of material is excluded from production tooling setups.

From each incoming shipment of solid carbide inserts a sample is selected by the tool inspection department and sent to the metallurgical laboratory for testing. Up to the present time, acceptance inspection testing has been confined to the solid insert type of material. Three tests are made on each sample as follows: Rockwell A hardness, density, and microexamination. From the results of these tests it is possible to determine with considerable accuracy the grade classification of the carbide.

Comparison charts are used to determine grade classification. These charts are built around the carbide grade classification system shown in TABLE 1 which consists of a chart indicating the various manufacturers' recommended grade of carbide for each Buick classification number. Hardness and density values have been obtained from the suppliers for each grade of their tungsten carbide material, and this information has been tabulated into a hardness chart and a density chart.

A set of photomicrographic standards was constructed by obtaining a sample of each grade of all suppliers' tungsten carbide material and producing a photomicrograph at 1500 magnification of the microstructure of each respective grade. These photomicrographs, 63 in all, were assembled into groups according to the TC grading number of the carbide classification chart. Since there are nine different TC grade numbers, there are nine pages in all with each page representing one particular TC grade of material. Thus by comparing the hardness, density, and microstructure of a sample

Table 1 — Carbide Grade Recommendation Chart

(Buick Code is identified by commercial grades)

Buick Code	Manufacturers' Recommendations							Typical Applications
TC-1	44A	H	2A6B	—	E-8	CA-3	GS	Roughing cuts on cast iron and machining nonferrous materials. Wear purposes and cutter blades
TC-2	883	HA	2A5	K-6	E-6	CA-4	GI	General-purpose machining on cast iron, nonferrous materials, stainless steels. Reamers and cutter blades
TC-3	905	HE	2A7	K-8	E-5	CA-7	GA	Light finishing cast iron and nonferrous materials
TC-4	999	HF	2A9	—	E-3	—	GF	Precision boring cast iron and nonferrous materials
TC-5	78C	T-04	EE	KM	945	CA-5	M	Roughing cuts on steel
TC-6	78B	TA	EM	K2S	710	CA-1	WM	General-purpose machining of steel
TC-7	78	T-16	E	K3H	606	CA-2	WH	Finishing cuts on steel
TC-8	831	T-31	EH	K5H	509	—	—	Precision boring and light finishing of steel
TC-9	44A	HA	2A5	K12	E-12	CA-10	GS	Wear materials, centers, rest blades, and gages

with these charts, it is possible to determine with sufficient accuracy whether or not the sample in question consists of the proper grade of tungsten carbide material specified.

Investigations are in progress in regard to making chemical analysis of tungsten carbide materials. Fairly accurate cobalt determinations can be obtained. With the use of the spectrograph a certain amount of grade typing can be accomplished with respect to the presence of titanium, tantalum and columbium carbides. However, until such methods are perfected and adapted to control work, the use of the microscope with the aid of hardness and density values is a satisfactory means of determining tungsten carbide grade classifications, and also the quality of this material.

There are certain characteristics readily recognized in the microstructure of the various cutting tool grades of tungsten carbide such as the cast iron and nonferrous cutting grades TC-1 through TC-4. The structures of these grades, when etched with alkaline potassium ferricyanide, consist of gray sharp-cornered grains of tungsten carbide and the unattacked cobalt material which appears white. The difference between grades TC-1 and TC-4 is in the grain size and the amount of cobalt present, *Fig.* 4.

Also, there are the steel cutting or crater resisting grades as typical of the TC-5 classification also shown in *Fig.* 4. The microstructure of this grade, when etched in the same manner, consists of some of the gray sharp-cornered tungsten carbide grains, the white unattacked cobalt, and the somewhat darker rounded grains of solid solutions of tungsten carbide and titanium carbide, or tungsten carbide and tantalum carbide, or a combination of all these three types of carbides.

As the percentage of titanium carbide and tantalum carbide increases, the number of rounded grains becomes predominant as in grade TC-7 illustrated in *Fig.* 4. The precision steel boring grade which usually contains a high percentage of titanium carbide has a somewhat different appearance as shown in *Fig.* 4. This is typical of the grade of TC-8 material most commonly used at Buick.

Tool Failure Investigation: To help promote the efficient use of tools, many tool failures are investigated to determine why normal tool life was not obtained and what steps should be taken to correct the conditions found. These investigations are carried out by the tool metallurgist with the aid of any other departments which can help in

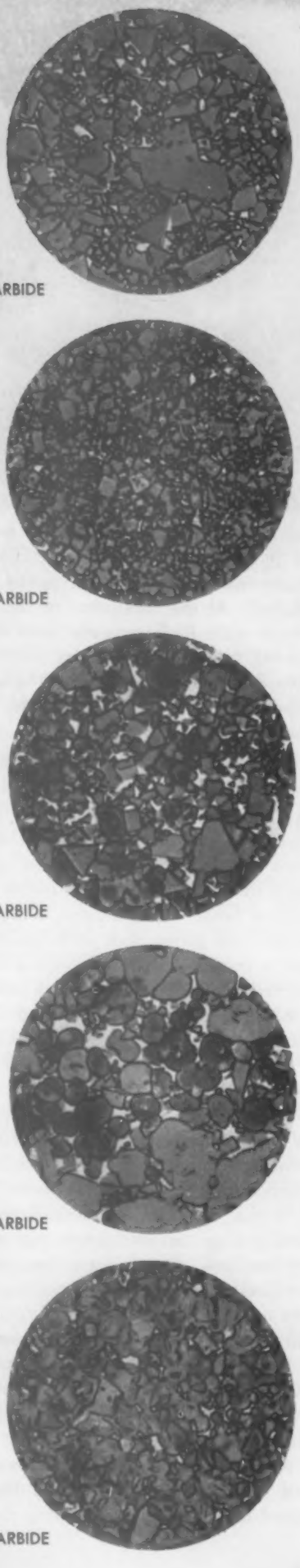


Fig. 4. Photomicrographs of typical grades of carbides employed for quality control. Samples are etched with alkaline potassium ferricyanide. Magnification 1500X.

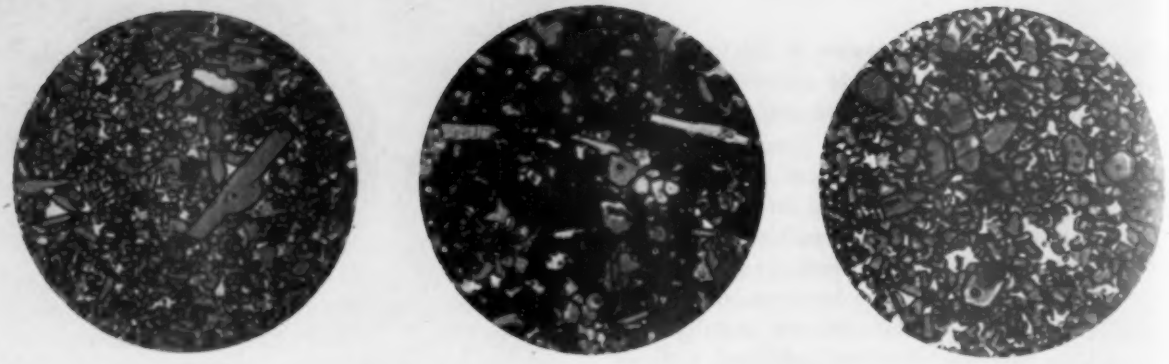


Fig. 5. (left) Photomicrograph of carbide tool which gave good performance. 1500X. Fig. 6. (center) Carbide tool which gave poor performance. The dark etching constituent is a carbon-deficient compound of tungsten carbide. 1500X. Fig. 7. (right) Carbide tool showing uneven cobalt distribution. 1500X.

solving the problem. After a thorough examination of the tool, chemical and metallurgical tests are made and all other factors in the use of the tool studied. At the conclusion of the investigation, a report of the findings is sent to all departments concerned with that tool. Some of the defects which have been found to cause tool failures will be discussed, using actual case histories as examples of the failures encountered.

TOOL MATERIAL QUALITY: The first group to be considered will be those tools which failed because the material was of substandard quality. In one instance a carbide tool of the TC-5 grade, used to bore and face a steel plate, was giving only one-tenth the normal number of pieces before it would chip or break. The hardness, density, and porosity of the tools giving poor performance were all similar to these properties in tools giving satisfactory service. However, there was a marked difference between the microstructures of the good tool and the poor one as shown in *Figs.* 5 and 6, respectively.

The dark-etching constituent in *Fig.* 6 was found to be a carbon-deficient compound of tungsten carbide which is caused by some improper technique in the manufacture of the tool. This compound is hard but extremely brittle. Chemically, it is W_2C, whereas fully carburized tungsten carbide is WC.

Several other investigations have associated this dark-etching carbon-deficient phase with low tool performance. In one case the number of pieces produced from a milling cutter, the blades of which had considerable amounts of W_2C, was only one-third the production obtained from cutters which did not have this structure. The carbide used was TC-1 and the material being machined was cast iron. Failure of tools containing W_2C has been by breaking in almost all instances.

Another case of low performance of a carbide tool was traced to poor cobalt distribution. This tipped tool, used for chamfering the back of rear-axle ring gears, was failing by chipping. The hardness and density were normal for this grade (TC-5), but an examination of the microstructure in *Fig.* 7 showed numerous large "lakes" of cobalt. This is due to improper mixing of the powders or to undersintering and is likely to give a poor bond.

Segregation of carbides is sometimes the cause of failure in high-speed steel tools. The segments of a 5½-inch diameter broach, *Fig. 8*, were failing by chipping. The hardness of the broken sections was 64-64.5 Rockwell C and the grain size appeared normal but severe carbide segregation, *Fig.* 9, was found. This was due to the fact that large-size bar from which the ring was made did not permit sufficient hot working from the ingot to break up the carbide segregate. To eliminate this condition, it was recommended that these broach segments be made from ring forgings to assure the maximum amount of hot work on the material. Carbide segregation has also been found to contribute to the breakage of drills and some other tools.

One of the most puzzling problems has been consistently lower performance of M-2 high-speed steel crankshaft cheeking tools made from one source's material. These tools have worn out prematurely with no apparent reason, as far as could be determined by the usual tests. There is a slight difference in microstructure as shown in *Fig.* 10 by which this vendor's high-speed steel has been identified on several occasions. The carbides are small and there is a coalescing of these carbides in a chain effect. However, determining why the structure differs and how that difference affects performance has been a more difficult problem.

Recently, a clue may have been uncovered when a more complete chemical analysis was made of several shipments of M-2 from this source for comparison with analyses made of material from a supplier whose tools have given consistently better

performance. While the principal alloying elements do not vary appreciably between sources 1 and 2, the silicon content of the M-2 high-speed steel from the source which has not performed well is lower, and there is more nickel, cobalt and copper. The effect of variations in the amounts of these elements is not understood fully at this time, but the fact that these are the only differences that have been found between normal and subnormal performance is considered significant.

A number of other tool failures was traced to improperly marked material, resulting in the wrong grade appearing on a tool. A carbide-tipped boring tool of TC-2 grade from one source outperformed that from another source when used on crankcases. Examination showed that the tools of low performance were not TC-2 but were actually TC-8.

TOOL HEAT TREATMENT: One of the most frequent causes of tool failures found in these investigations has been that of improper heat treatment. An excessive depth of high-speed case has been one of the recurring factors in broken tools. The theory among tool manufacturers seems to be: "If a little case is a good thing, a whole lot would be better." This has been especially true of tap manufacturers. Taps with excessive high-speed case depth usually fail within a short time from chipping of the thread as shown in *Fig.* 11.

Chipped and broken taps have been found with as much as 0.003-inch case depth, whereas tests have shown that 0.001-inch case depth is about the safe maximum that should be used. High case depth has also been a contributing factor in the failures of hobs, broaches and other tools.

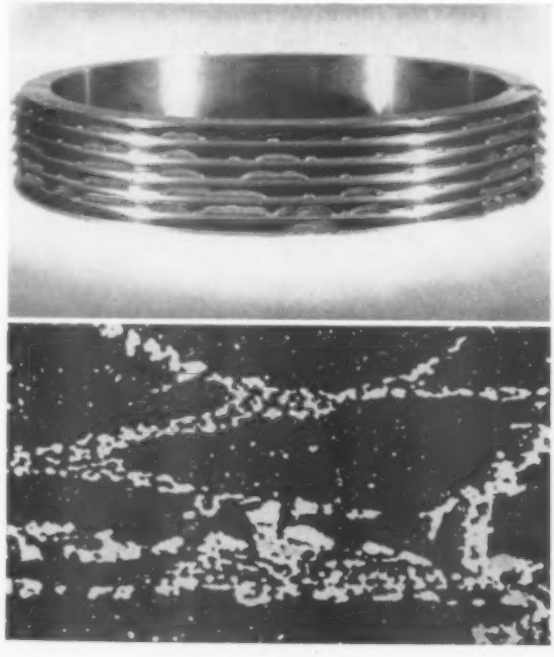


Fig. 8. Chipped teeth in broach segment were caused by improper grinding.

Fig. 9. Photomicrograph of broach segment illustrated in Fig. 8 shows carbide segregation. Nital etch, 500X.

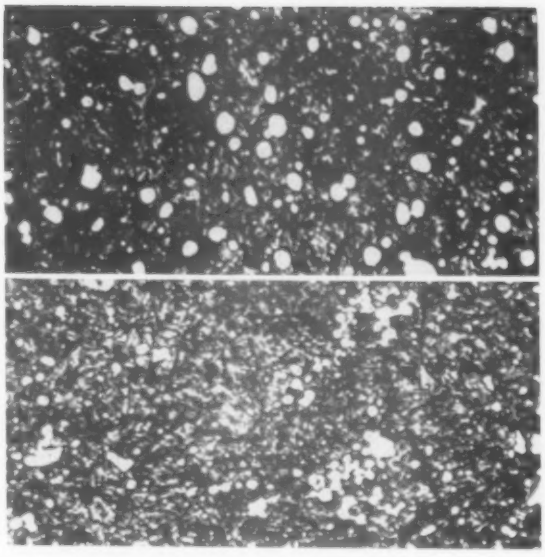


Fig. 10. High-speed steel photomicrographs show normal structure on the top and abnormal structure on the bottom. Nital etch, 1000X.

The use of the wrong hardening temperature is another cause of tool failure. The photomicrograph in *Fig.* 12 shows the structure of a circular form tool made of T-1 high-speed steel which failed by chipping at the cutting edge. The structure shows that the tool was overheated in hardening, as evidenced by the fusion of carbides, the large grain size (3 to 7 as determined by the intercept method) and the structure of the matrix.

High-speed steel is, of course, not the only material damaged by overheating in hardening. Several cases of broken tools made of GM 46 M steel have been traced to this cause. To determine the extent of overheating, samples were hardened within a wide range from 1450 to 1700 F. These were tempered and their microstructures were examined for comparison with the broken tools. Checks made in this way indicated that some GM 46M tools had been hardened at temperatures as high as 1600 F.

Underhardening and undertempering are even more frequent causes of tool failures than is overheating for hardening. Some tool manufacturers make a practice of hardening from a low temperature because there is less danger from cracking in quenching, and the tools are less likely to break in service if the hardness is on the low side of the specification. On the other hand, underhardened tools are sometimes undertempered to keep the hardness of the tool high, and then breakage is likely to result because of incomplete tempering of the tool.

One group of crankshaft flange tools was giving low life and there had been several broken tools after running only two to five pieces. The microstructure showed that the tools were undertempered, so two tools of the lot were double-tempered at 1025 F. These gave 60 and 65 pieces per grind so the rest of the tools were given this treatment also and the trouble disappeared. Other heat treating faults which have been encountered include decarburization or carburization of the surface and quench cracks caused by allowing the piece to remain in oil until cold.

The number of failures resulting from improperly heat-treated tools, and the variety of defects that have been traced to faulty heat treatment indicate that, in spite of the emphasis that has been placed on this phase of tool manufacture, a great deal more education is still required if poor heat treating is to be eliminated as one of the major causes of low tool performance.

DESIGN PROBLEMS: In many instances no causes of failure are uncovered by metallurgical examinations. Sometimes the design of the tool can be improved and the failures eliminated in this way. The milling cutter shown in *Fig.* 13 failed for two reasons: (1) the bottom of the driving slot had a sharp corner, and (2) the driving side of the slot came at the point where the wall was thinnest. By rotating the slot a few degrees so the tooth thickness provided added strength and by providing a radius at the bottom of the slot, breakage was overcome.

Web thickness has been found to be an important factor in drill breakage. In a number of investigations it has been found that drills with thin webs were breaking while drills with heavier webs were performing satisfactorily. There is a limit to the desirable web thickness, however. In one case failure was traced to a combination of thick web and small flutes which did not provide adequate chip clearance. Reworking these drills to provide greater chip clearance resulted in satisfactory tool life.

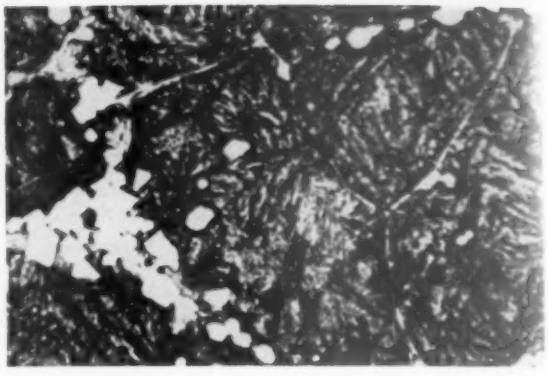


Fig. 12. Overheated structure of T-1 high-speed steel. Excessive heating is evident by carbide fusion, large grain size and structure. Nital etch, 1000X.

GRINDING: The material may be entirely satisfactory and properly applied, the heat treatment may be letter perfect, the design may be good, and still the tool may be ruined before it makes a single production part. The grinding must be done carefully or all may be lost. Some grades of steel and carbide must be ground with greater care than other grades. The high-speed steels containing larger amounts of vanadium are notorious in this respect. Excessive breakage was encountered on a group of M-4 lathe tools which, on examination, showed that all sides of the tool had been burned in grinding. There was no checking or cracking from grinding, but there was a layer of untempered martensite several thousandths of an inch deep. The tool was brittle and broke when making the cut. This condition is shown in *Fig.* 14.

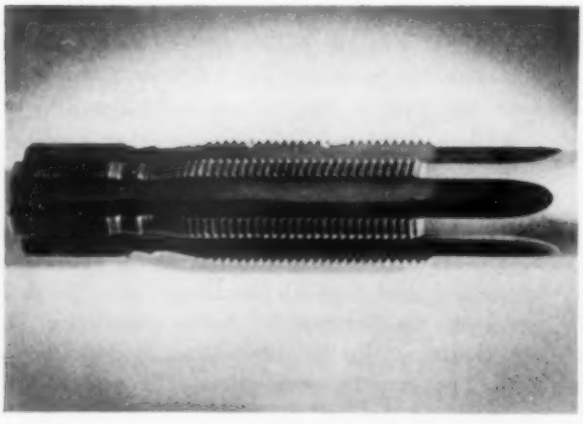


Fig. 11. Teeth on tap failed by chipping because high-speed case depth was excessive. Such chipping usually occurs within short time.

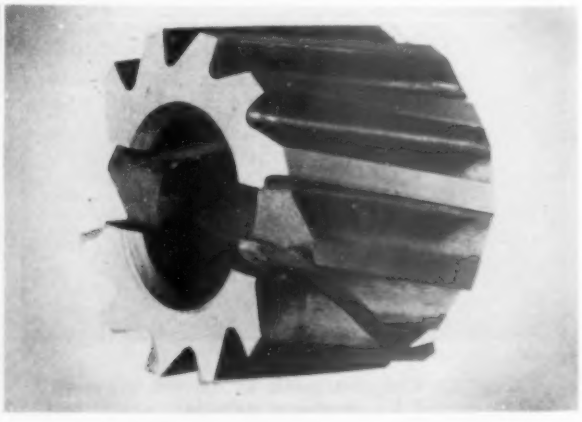


Fig. 13. Milling cutter failed because of poor design. Driving slot has sharp corners and driving side is at thinnest section.

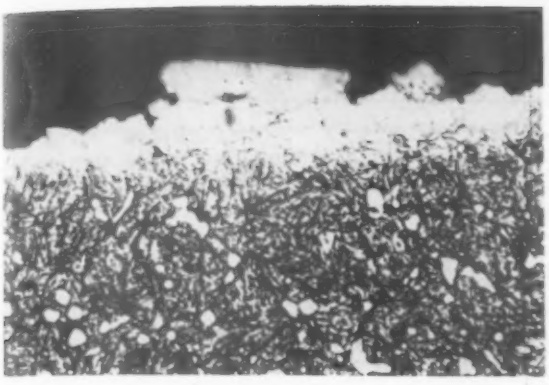


Fig. 14. Photomicrograph of high-speed steel has brittle rehardened layer caused by grinding burn. Nital etch, 750X.

Not all grinding damage is due to heat. *Fig.* 15 shows a broach which broke because of improper grinding. The photograph shows the roughness of the grind, the way the body of the broach has been ground undersize, reducing the strength, and probably most important of all, the way this undercut next to the cutting edge causes the chip to curl too tightly, thus overloading the broach.

Some grades of carbide are cracked readily in grinding. One of the frequent causes of cracking in carbide is due to loading the wheel while grinding clearance on the steel shank under the tip and then overheating the carbide tip while grinding with this loaded wheel. *Fig.* 16 shows a cracked tip which probably resulted from this practice.

These case histories have been chosen as typical examples of the causes of tool failures and by no means represent all of the reasons for failures. The examples chosen have dealt primarily with the defects of the tools. Faulty productive parts and poor mechanical conditions in the machines using the tools are frequent causes of tool failures. Then, too, there are the problems caused by the human errors introduced; failure to tighten a chuck properly, a tool not tightened, coolants not directed at the work, running a tool too long before replacing it, and a host of others. Sometimes it is not possible to determine the cause of failure because conditions have changed and the problem no longer exists by the time the investigator can check the operation in the shop.

The cases discussed have had only one principal defect to which failure could be attributed. The answer is not always so easily found. Often more than one thing is wrong and, while perhaps no one of them would cause the trouble singly, the combination of defects results in low tool life.

Factors Affecting Tool Usage: Many times it is necessary to look beyond the tool itself in order to solve a usage problem. The tool material, heat treatment and design are only a few variables among many in a machining operation. The average life of tools can be increased in many instances by adjustments in the machinability of the productive material. Recognition by the metallurgist of the importance of structure in its effect upon machinability will often lead to changes in processing, heat treating, or inspection of productive material. Many times such changes will do more to increase tool life than anything that could be done in improving the material or the heat treatment of a tool. Many instances have been encountered where a better quench in the hardening operation greatly improved machinability and increased tool life.

Much tool waste occurs from defective productive material. Castings or forgings with improper cleaning, excess stock, chilled or hard surfaces

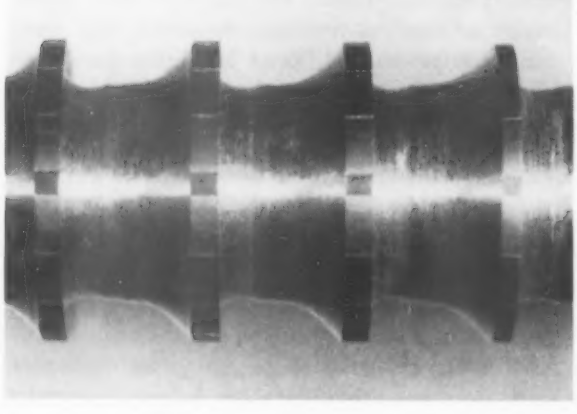


Fig. 15. This broach failure was caused by improper grinding, which resulted in overloading by chip curling too tightly.

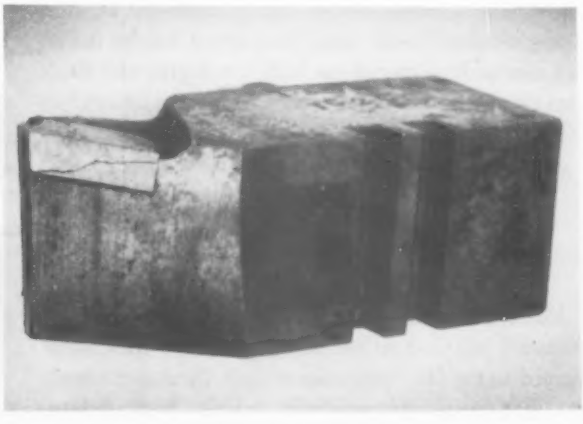


Fig. 16. Carbide tip is cracked. Failure was caused by overheating due to a loaded wheel, resulting from grinding the steel shank.

Table 2 — Recommended Cutting Speeds for HS Steel and Carbide Tools According to Hardness of Material*

Hardness (Rockwell C)	Tool † Material	Turning (fpm)	Milling (fpm)	Broaching (fpm)	Hobbing (fpm)	Shaping (fpm)	Drilling (fpm)	Tapping‡ (fpm)	Rough Boring (fpm)	Finish Boring (fpm)
0-20	H. S. Steel	80-100	80-100	25-35	80-100	80-100	80-100	50-90	80-100	——
	Carbide	225-325	225-325	—	—	—	—	—	225-325	600-1000
20-26	H. S. Steel	55-80	55-80	25-35	55-80	55-80	55-80	50-65	55-80	——
	Carbide	200-300	200-300	—	—	—	—	—	200-300	500-1000
26-32	H. S. Steel	45-55	45-55	20-30	45-55	45-55	45-55	40-50	45-80	——
	Carbide	175-250	175-250	—	—	—	—	—	175-250	500-800
32-38	H. S. Steel	40-45	40-45	20-30	40-45	40-45	40-45	30-40	45-45	——
	Carbide	150-225	150-225	—	—	—	—	—	150-225	300-600
38-43	H. S. Steel	30-40	30-40	15-25	30-40	30-40	30-40	15-30	30-40	——
	Carbide	125-200	125-200	—	—	—	—	—	125-200	250-600

* This chart is based on depths of cuts commonly used in automotive machining. There are many other factors which must be considered in the application of the correct cutting speed such as:

1. Dimensions of the cut (feed, depth, etc.)
2. Tool form (angles, radii, type, etc.)
3. Tool material (variation)
4. Cutting fluid (type)
5. Rigidity and freedom from chatter of machine tool, work and work holding device
6. Shape and dimensions of work
7. Nature of engagement of tool with work (continuous or intermittent, "Entrance" and "Exit" conditions, etc.)
8. Chemical composition of work
9. Microstructure of work
10. Horsepower conditions

† In addition to hardness of the work, the following factors govern the cutting speeds for taps:

1. Outside diameter of the tap
2. Pitch of the tap
3. Depth of tapped hole
4. Percentage of thread in tapped hole

‡ HS Steel—GM M-2 or GM T-1; Carbide — See carbide grade recommendation chart in TABLE 1.

cause excessive dulling and breakage of tools. Improved process control and inspection will do much to eliminate these conditions.

It is always desirable to remove material while the part is in its most machinable state, but in many instances it is necessary to perform machining operations after quenching and tempering. As the hardness of a material increases, its resistance to machining increases. It is therefore necessary to reduce the load on the tool by adjusting the feeds and speeds.

As an aid to the process engineer, the Buick tool committee has developed a chart showing the approximate relation between the hardness of steel being machined and the cutting speed for the different machining operations both for highspeed steels and tungsten carbide. This chart is shown in TABLE 2.

Summary

The best place to control tool usage is in the processing stage. Available tools must be applied properly, feeds and speeds must be compatible with the properties of the part being machined or tool waste will result.

Comparison of results between plans or operations can be used only as a guide. Direct comparisons are confusing in most instances. The word machinability often has a different meaning from one operation to another.

Progress in the reduction of tool usage is not easily measured. Only adequate records give a clear picture and good records are costly. Application of the best available materials, heat treatment, equipment, and "know how" through a thorough education is the only way to achieve the greatest efficiency in tool usage.

ERRATA—In the article "Applications and Advantages of Cast-Alloy Cutting Tools" which appeared in the October issue of THE TOOL ENGINEER, the statement on page 39 which began paragraph two under heading "Selecting the Grade of Cast Alloy", read "*Changing from high-speed steel:* start with one of the harder (higher alloyed) cast alloys, and change to a somewhat softer grade if results so indicate."

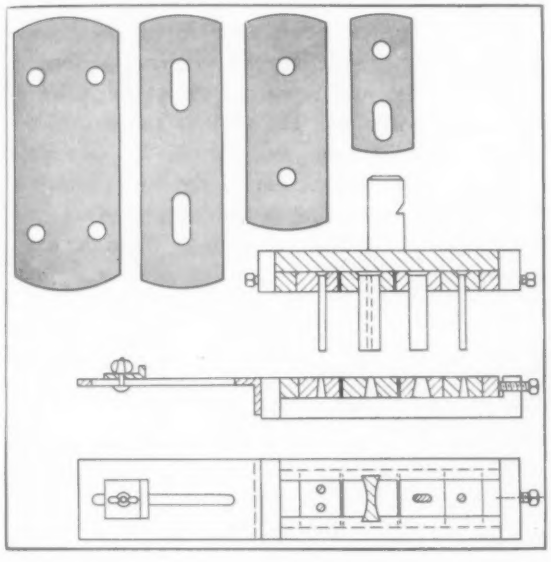
It should have read, "*Changing from high-speed steel:* start with one of the softer-but-tougher grades (with lower percentages of chromium and tungsten); and change to a higher-alloyed grade if results so indicate."—*Editor.*

Gadgets

Ingenious Devices and Ideas to Help the Tool Engineer in His Daily Work

Multi-Purpose Dies

In sectional dies, the sections are usually designed so that the die openings are exposed for easy machining. In the case illustrated here, the sections are made with closed die openings so that there is a possibility of interchanging some sections and using the tool for several parts. It is possible to develop a few universal dies in sections which permit the production of a wide variety of parts with only a few components. Shown here is a pierce and cut-off die which produces the parts at the top of the figure.



The tool is composed of the die proper and the punch system. The die is a firm die holder composed of prismatic sections which are interchangeable. There are several kinds of sections, made from tool steel and hardened and ground, such as cutting-off blocks and piercing sections. In addition there is a stop which may be regulated. The correct alignment between the die blocks and the stop is insured by proper fill blocks, shims, guides or other devices which permit quick changes but at the same time maintain accuracy. The whole is clamped together by means of form bolts.

The punch holder is made up in much the same manner as the die holder. The punch arrangement can be shifted with respect to the shank in order that the shank should lie in the exact center of the cut.

Federico Strasser
Santiago, Chile

Trimming Device

A set of three small hinged jigs and a hand router is being used in the sheet metal section at Temco Aircraft Corporation, to trim tooling tabs from aircraft skin sections much faster than was formerly possible, and to eliminate most rework and scrap which resulted from the method formerly used.

Previous to the development of the jigs, tooling tabs were removed with hand shears or band saws, with the method depending on the thickness of the skins. These methods required excessive handling of skins which in turn resulted in scratched and marred surfaces. Often as much time was spent in burnishing and polishing as in actual trimming operations.

Each of the jigs is made from two fiber strips, hinged together so that one fits flat on each side of a stack of skin sections. Each strip is faced with felt to prevent damage to skin surfaces. One of the fiber strips serves as a router guide and has a metal edge to prevent excessive wear. The jigs are made in sets of three, with one having a straight edge, one concave and one convex, so that tabs may be trimmed from curved as well as straight edges. Two adjustable stops insure accurate positioning of the jigs on the skin sections.

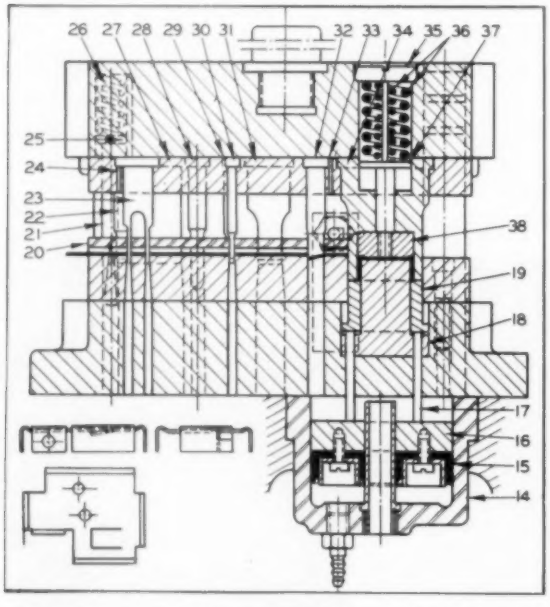
From two to ten skins may be trimmed simultaneously, the number depending on the thickness of the material. Positioning pins are inserted in the tooling pin holes to keep the skins in alignment until the jigs are clamped in place.

M. H. Guy
Dallas, Texas

Compound Die

The piece shown here for a padlock is produced in quantity. It was therefore desirable to design a die which would stamp out this part with a minimum of time and effort. At the top of the sketch is shown the horizontal layout of the die and below it is a section through the die.

The strip is centered at the left end of the die by unwinding it from reeled coil stock. The forward end is registered against the first stop finger, 4. A reciprocating automatic slide feed for high production feeding is used.



The progress of the material through the die and the work done at each station is shown at C. A round hole is pierced at the first station which is used for exact locating of the strip stock when feeding through the die. At the second station a hardened and ground steel pilot, 28, enters this hole and locates the stock for succeeding operations. At the fourth station, the stock is cut off and the bending punch, 34, forms the four wings which are bent at a 90-degree angle. At this station, the embossing operation is also performed.

The finished piece is ejected from the die by the shedder, 19, by air pressure. Details are shown at 14, 15, 16 and 17. The piece is ejected from the cutting-off and bending punch 34 by the shedder, 38, by means of compression coil springs, 36.

The finished piece is blown out from the die by air pressure through an air pipe, 13.

Hjalmar Dahl
Upplands Vasby, Sweden

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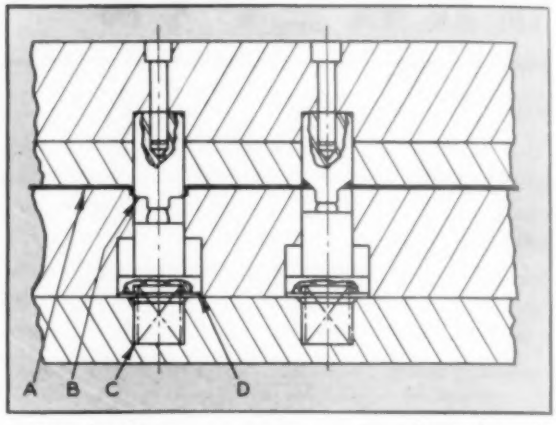
Die Aligner

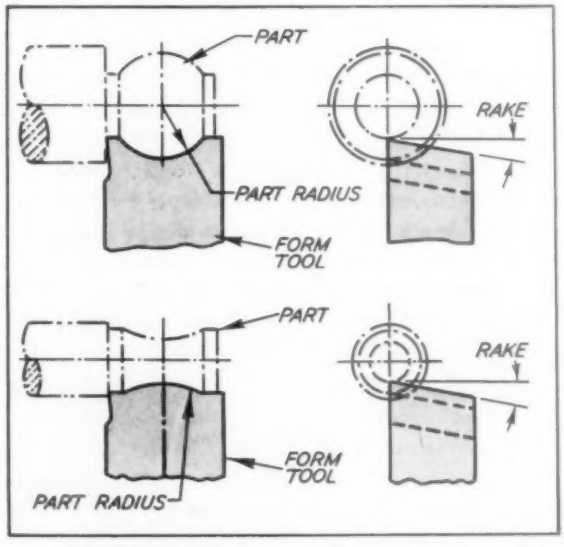


Sketched here are two ways in which this die aligner may be used. The aligner D is located in the bottom die and is used to pilot the piece B when the die is open. The pilot is raised over the surface of the bottom of the die by means of spring C. When the die closes, the upper punch B presses the pilot so that it does not interfere with the bending or extruding operation. When the press ram is raised, the pilot may act as an ejector.

Peter Balsells
Dayton, Ohio

Form Tool Radii

Illustrated in the sketch is a method for determining the corrected radius on a form tool. The method is not exact, but the approximation which is obtained is close enough for all practical purposes. For the convex radius on a part, the corrected radius on the tool is equal to the part radius divided by the rake angle of the form tool. For a concave radius on the part, the corrected radius on the form tool is equal to the part radius multiplied by the cosine of the rake angle of the form tool.



George A. Nelson
Los Angeles, Calif.

Industrial Development Depends on Cooperative Research

By W. E. Mahin

DIRECTOR OF RESEARCH
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TO DEFINE RESEARCH is somewhat involved since the term really means investigate. The question remains, investigate what? As in *Fig.* 1, five separate types of research can be arbitrarily shown. These are drawn as an interconnected progression of areas, differing from each other in the general nature of the "what" investigated and its purpose. Each area is shown overlapping its neighbors since there is in fact a shading of each one into the next. Fundamental research is shown at the bottom and product and process control at the top to connote the dependency of each higher area on its lower neighbor as a supporting fundation. This reverses the concept that the fundamental scientist has his head in the clouds and gives the scientist credit for the fact that without him and his predecessors there would be no science, and engineering at best would be only empirical.

The second area, basic applied research, differs from the fundamental largely in its purposes. This types of research can consist of probing deeply into the laws of energy and matter but with the objective of answering the why or how of some practical phenomenon or problem.

The remaining three areas decrease progressively upwards in the extent to which basic laws are studied. On the other hand, the problems of these higher areas become increasingly practical in nature to the right and upwards.

The third and fourth areas from the left carry the highest probability of resulting in invention and in design features that have customer appeal. The fifth or top area is sometimes given the slightly undignified term of "testing" but is actually of utmost importance to the maintenance of high standards of quality and uniformity.

It may be noted that the agency most likely to conduct each of the five areas of research is shown on the chart also. In this connection, the vast majority of true fundamental research is still being carried out by the graduate schools of colleges and universities. On the other hand, the research and development laboratories of industry and the independent not-for-profit research institutes and foundations concentrate their efforts in the areas of basic applied and developmental research.

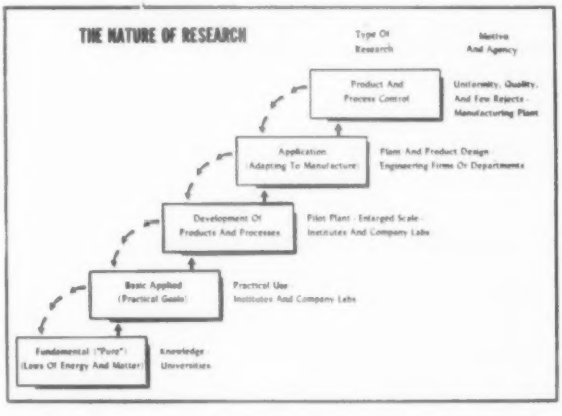


Fig. 1 shows five separate types of research areas. Arrows indicate their interdependence.

Presented at Twentieth Annual Meeting, American Society of Tool Engineers, March, 1952

Cooperative Research in Great Britain

Another way of expressing the ideas of *Fig.* 1 is shown in *Fig.* 2. This chart is taken from the publications of the British Iron and Steel Research Association. This association is one of approximately 45 such groups in Great Britain, some of which have been organized since World War II for the purpose of stimulating the technical and scientific advancement of broad industries in Great Britain. One of BISRA's main functions is the carrying out of research in the interests of the steel industry as a whole. The BISRA chart indicates by the dotted line having its apex at the top of the chart that the concentration of research effort sponsored by the association is in the area which we have called basic applied research.

BISRA may be taken as representing a trend toward cooperative research that has gone much farther in Great Britain than in this country. In 1949, £400,000 were allocated to BISRA, and this

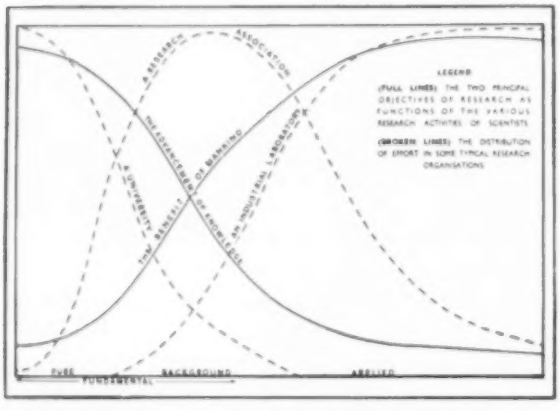


Fig. 2. Graph indicates the objectives and distribution of research. From publications of British Iron and Steel Research Association.

compared in that same year to approximately £1,800,000 spent by the steel industry outside of BISRA.

Cooperative Research in the United States

Whether or not it is due to lack of government support, cooperative research by industry in this country is at a far lower level than that presently found in Great Britain. Again citing as an example the steel industry, there is the American Iron and Steel Institute which launched, just after World War II, a program of cooperative research. The AISI approach has been entirely based on the private enterprise system. While various research committees have been formed and close liaison is maintained between research workers in the various corporations, the research program itself tends to be somewhat cautious with regard to the prerogatives of the individual companies.

The philosophies of this Institute's operation can best be expressed by quoting from the Chairman of the General Research Committee, Dr. E. C. Bain, who says, "No one surely doubts that a factor in the industrial development of our country which has made possible an incomparable standard of living is the typically American habit of rivalry—a lively, constructive rivalry controlled by fairmindedness. Let no one suppose that this creative kind of rivalry is not a factor in research activities. The competitive spirit is found there in a very lively though wholesome form. For this reason the General Research Committee will, we feel confident, regard Institute-sponsored research as supplementing rather than ever replacing the kind of research which each enterprise will accomplish for itself. There is need for both types; in the race for better processes and products the competitive aspect continues. And this is all the better, for perhaps faster records may be made by the general clearing of the course provided by some properly selected inquiries planned collectively by the steel industry in general. This job the Committee is endeavoring to do."

The AISI is now sponsoring a substantial research program. This work is being done for the most part in the laboratories of the universities and the independent research institutes and foundations under the close supervision of small membership subcommittees in the General Research Committee.

One of the most substantial American examples of cooperative research is the Portland Cement Association, with 67 member companies. This association's modern laboratory was built in Chicago since the war at a cost of some three million dollars. In this laboratory projects are carried out on the production and uses of portland cement and the design of structures utilizing this basic material. In order to put into practice the results of the laboratory, the Association maintains 300 field men.

The Structural Clay Products Institute is an association of brick and tile manufacturers. Several years ago, this group realized the need for research in order to keep in the running with some of the newer industries springing up in the building material field. A careful study of their problem of organizing for cooperative research was made by an independent consulting firm. From this study has come the Structural Clay Products Research Foundation with a full time and highly competent scientist as the director of research. Under the leadership of this man and with the guidance of a small committee representing the Institute, a long range program of research and development was planned. Instead of building their own laboratory, they have contracted with the University of Illinois, Penn State College and the Armour Research Foundation. At the Armour Research Foundation a broad program on the study of brick walls and tile panels is under way, while the two universities are conduct-

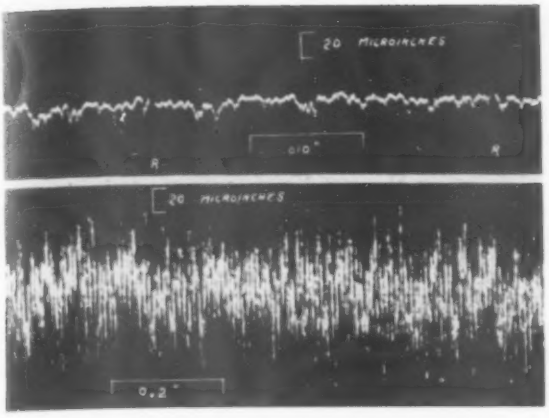


Fig. 3. Shown here are typical Brush Analyzer curves for as-ground surfaces.

ing studies on the thermal properties and weathering of structural clay walls.

The director of research of the SCPRF acts as the sponsor's representative for each of these programs and in turn is responsible for the interpretation of the results by the member companies.

The Steel Founders' Society of America also conducts research by employing a full-time director of research. Again, the type of programs undertaken are basic studies of the processes involved in the making of conventional steel castings. This work also is carried out in the not-for-profit research groups and the universities.

While there are many engineering and scientific societies in the United States, with memberships of up to 66,000*, comparatively little cooperative research is undertaken by these societies at the present time. There is, however, a slight trend in that direction.

For example, the American Foundrymen's Society with about 10,000 members has within the past five years established several small research programs at Battelle Memorial Institute, the Armour Research Foundation, Massachusetts Institute of Technology, University of Michigan, Columbia University, and Cornell, consisting of basic investigations of interest to the various divisions of the society.

The American Society of Heating and Ventilating Engineers (5,000 to 6,000 members) operates with an annual research budget of over two hundred thousand dollars. This money is spent in its own laboratory and in work sponsored at outside institutions. Typical projects include the study of heat transmission through glass blocks, air cleaning, air flow and distribution, panel heating, etc.

One Example of Cooperative Research in Tool Engineering. Turning now to the specific interests of the American Society of Tool Engineers there is at least one research organization which might be examined briefly to see how it is putting research into practice to benefit its associate companies en masse as well as individually. This is the B.S.A. Group Machineability Research Laboratory[2] which was established in the British Isles about five years ago.

In addition to the machine tools and auxiliary equipment which this laboratory contains, the various projects make use of the Main Laboratories of the B.S.A. Tools Group located in the same building, especially such facilities as the metallurgical laboratories, physical testing, chemical analysis, heat treatment and X-ray diffraction. The program of research being carried out falls into the following categories: development of the complete range of cutting tools, including design, manufacture, testing and practical operation; development of tool materials, including manufacture and ultimate uses; improvement of machining properties of existing and new materials; determination of correct machining techniques for existing and new materials and their application to industry; advisory service on cutting fluids to B.S.A. Group of Companies and others; development of cutting fluids including cooperation with major oil companies and other research organizations; basic applied research on machining including tool, work-piece, cutting fluid and machine.

This cooperative research effort is not the same as the British research associations earlier discussed in that, so far as the writer knows, no government support is provided and the companies cooperating are corporately related.

Basic Applied Research Is the Best Field for Cooperation under the American System

Up until a few years ago the character of research work in tool engineering was largely one of machine testing of tools for life expectancy under various conditions followed by making changes to increase the tool life. The object of such investigations was usually to improve a single specific machining operation and cut costs on that operation. While this type of investigation is important and must be continued especially for the purpose of collecting data on performance, there has been a tendency more recently for the tool engineering research worker to engage himself in research programs which have such objectives as finding out why cutters cut more effectively under one condition than another, why tool life varies under different conditions and why certain cutting fluids improve the machining operation and others affect it adversely.

It seems clear that significant opportunities for cooperation in research exist under the American free enterprise system. The idea behind the engineering society itself is that of cooperation at a

*Numbers refer to references listed at close of the article.

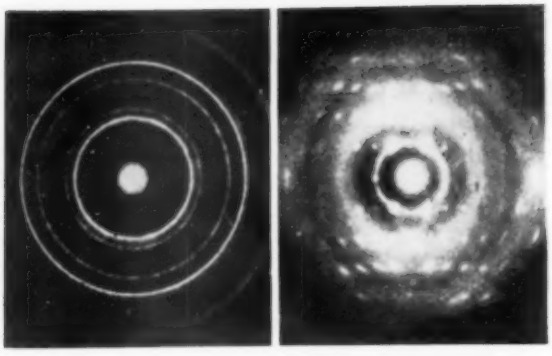


Fig. 4 shows two electronic defraction patterns. *A*, at left, pictures a typical metal pattern, while *B*, at right, reveals the pattern made by stearic acid film on metal.

technical and scientific level. It is not inconsistent for engineers to share the benefits with each other of their general background of experience and at the same time withhold from each other that information which is deemed proprietary.

Applying the above philosophies to research, the main problem is to define an area of research which meets two tests. (1) The main objectives are to provide basic or background information that is of maximum benefit to the greatest number of individuals and groups represented in the society or industry. This is the second area from the left in *Fig.* 1. (2) The objectives of the research are not the development of specific end products or processes of patentable nature even though such a development might result as a by-product of the achievement of the main objectives. These latter areas of research would be the third and fourth from the left in *Fig.* 1.

Some Examples of Basic Applied Research Problems in Tool Engineering

Basic applied research on the mechanism of cutting of metals by a tool might well result in new developments or ideas which in turn could lead to substantially faster methods and reduced costs. Investigations have already shown[8] that with higher machining speeds, with suitable machines and cutters, tool loads are lower and surface deformation is less. Also it is now known that the factors limiting the rate of metal removal or cutting speeds are the rigidity of the machine (sufficient rigidity is necessary to prevent tool vibration and distortion of the machine), temperature of the tool cutting edge (higher temperatures reduce the wear resistance of the tool), and the cutting fluids used and the manner of their use.

Metallic Surfaces. Probably the surface finish as well as the condition of the surface of the cutting tool is more important in high-speed machining than when machining at lower speeds. Studies made some years ago in the automotive industry by several investigators of wear phenomena in bea- ings might be of interest in this connection. It w shown in these wear studies that more wear o curred where the metal at or near the wearing su face had been severely worked as by burnishing o grinding under high loads than occurred on sur faces where the metal was in the undisturbed con dition. Wear rates in these two instances tended t become equal after the undisturbed layer had bee worn off. It seems to be generally agreed tha smoother tool surfaces give better tool life. *Fig.* 3 shows typical Brush analyzer curves for measuring surface smoothness. However, little or no data have come to attention showing the difference in tool life with tools of different degrees of cold work, burnishing or metal displacement.

For this type of investigation a team composed of tool experts, metallurgists and microscopic, X-ray diffraction and electron diffraction metallographers can furnish valuable experimental data. By means of X-ray diffraction the amount of cold work, or metal displacement, can be estimated without destroying the tool. *Fig.* 4 shows X-ray diffraction patterns of metal in which the structure has not been disturbed or distorted by cold working or burnishing and is essentially free from all but minor stresses in the skin (lower right). *Fig.* 4 also shows metal in the highly worked condition after machining (upper left). Thus, cutters with varying degrees of cold work can be examined before being subjected to tool life measurement. Microscopic examination which will be destructive so far as the tool life measurements are concerned can be used to check the results obtained from the X-ray examination.

Cutting Fluids. The influence of cutting oils and their method of introduction on cutting efficiency can also be studied in the same manner. As mentioned earlier, the results of some interesting experimental work have been published by R. J. S. Pigott of the Gulf Research and Development Company in which he shows that a stream of cutting oil under high pressure can be directed so that it will travel to the cutting edge of the tool. By coming in contact with the cutting edge, the cutting fluid is actually able to cool at or very near the point of heat generation and thus keep the cutting edge cooler than conventional methods do.

Electron diffraction studies of metal surfaces on which a thin film of proposed cutting oils has been spread will indicate the ease of reaction between film and surface as well as the conditions under which the reaction takes place most rapidly and may show how the reaction product is destroyed or disrupted. Such studies can be made in the laboratory independently of a machine shop and therefore may proceed more rapidly and more economically than when complicated by shop studies. Election diffraction patterns illustrate (1) the con-

dition of a metal surface that is clean, and (2) one that is wet by a liquid which is oriented on the surface.

Machining at Various Temperatures. During the last several years some results on machining at elevated temperatures have been reported and some of the early results have been reviewed before the Society.[4] By heating a thin surface layer of metal ahead of the tool it has been found that less energy is needed to perform the machining operation.

Thus another new area for research has been opened and an opportunity for doing a better job of machining for less money has been created. Machining for less money has been created. Machining temperatures need no longer be in the room temperature range but can be adjusted for the most economical temperature. Further research can produce data which will indicate the proper temperature to use for various combinations of work, operation and tools.

While the above discussions of specific problems and developments in the cutting of metal have become somewhat involved, a relationship between basic applied research and development has been repeatedly indicated. Development engineers need basic information obtained from the research laboratory just as a plant requires root feeding. Wide activity in basic research stimulates the development of new products and processes. On the other hand, in the absence of research activity of this nature, engineering development cannot flourish.

Teamwork Approach Used in the Larger Laboratories

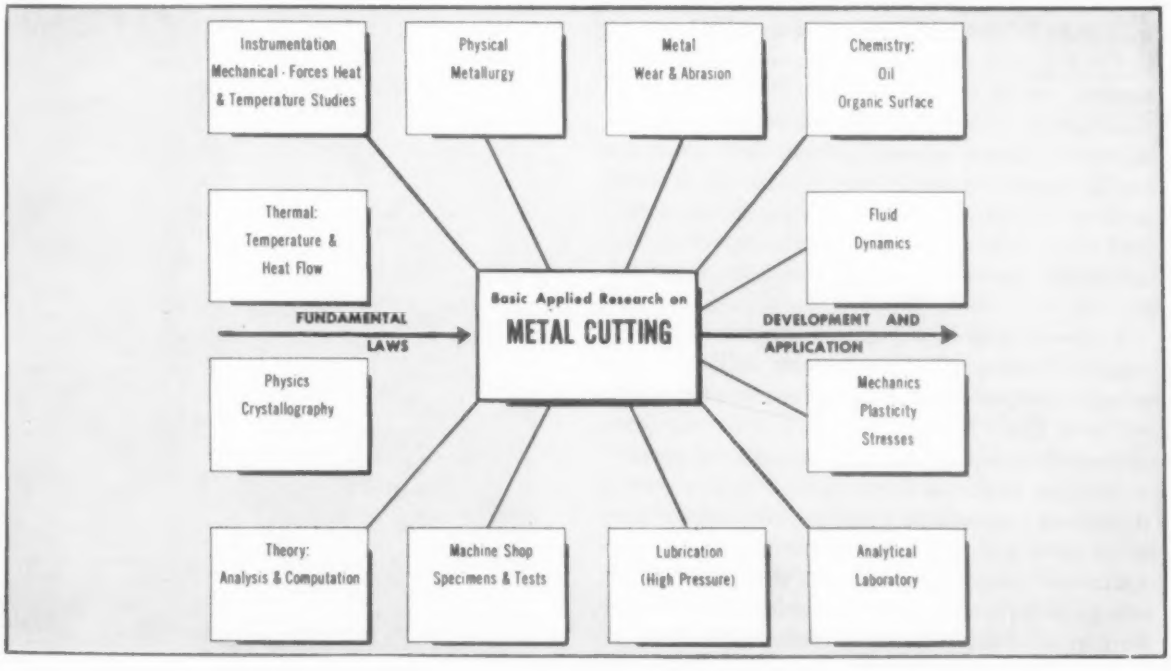
Basic applied research is becoming more complex as the frontiers of science and engineering are moved back. No longer can a scientist compete by working alone, except for a disciple or two, in a single laboratory. Contrariwise, a definite advantage lies with those research organizations which are sufficiently large to justify specialized personnel and facilities in a wide variety of scientific and engineering disciplines. Under this system, a basic problem is carefully analyzed for its significant parts and a team of specialists, each with his special facilities or laboratory, is brought together with the single objective of solving an industrial problem.

Illustrating this principle of operation, *Fig.* 5 shows the separate fields of investigation that might well be needed in a thorough analysis of a problem in the cutting of metals. *Fig.* 5 is related to *Fig.* 1 by the two arrows to the left and right of the main central block representing the basic problem.

From such basic research comes an educational by-product that is of almost inestimable value. The scientific papers that can be presented before the societies stimulate the thinking of the engineering profession. One new technique or discovery frequently leads to several others. In addition, as frequently recognized by large industrial organizations, research has a great amount of publicity value.

It was mentioned earlier that it requires a relatively large organization to apply with fullest value

Fig. 5. The various fields in which investigations might be conducted when studying a metal cutting problem are shown here. Relationship in connection with Fig. 1 is indicated by arrows.



the teamwork approach to basic applied research. In Great Britain, such larger organizations are formed within the fabric of the industry itself. In America the trend has been toward independent not-for-profit research institutes and foundations. There are now three such organizations in this country of very considerable size: Mellon Institute, founded in 1911, with a total staff of 760; Battelle Memorial Institute, established in 1929, with a staff of 1600; and Armour Research Foundation, a relative newcomer established in 1936, with a staff of 980. In addition to these three older groups, since the war a number of smaller organizations have been formed and are growing rapidly.

Basic Applied Research Is the Common Problem of All Engineers

Research problems of basic nature to a field of engineering are in reality the common problem of all engineers and industry in this field. Most rapid progress in development of the field will occur if the basic problems are subjected to the concerted attack of industry as a whole. Small industry should not expect large industry to bear all of the burden even though the larger concerns have the best equipped and largest research staffs.

Under the American system, cooperative research can best be carried out in the independent not-for-profit research institutions, or in the universities. The cost may be covered by contributions to a common research fund from all those interested in the problem. Each company may contribute according to its size. The planning board for the research may consist of representatives from the industry chosen by the group as a whole. Preferably the group should employ a single individual to plan and direct the research.

An alternative plan is for the industry as a whole to operate its own laboratory as done so extensively in Great Britain and to a much lesser extent in this country, as in the case of the Portland Cement Association. This plan is not a good one, however, unless the annual research budget and funds for capital investment can be very substantial. Without such substantial expenditures, a separate laboratory could not possibly be adequately equipped and sufficiently staffed to operate under the teamwork plan.

Across-the-board industrial support of well-organized basic research programs will lead to a selection of those basic fields to be explored which will most likely benefit a majority of the members of the industry. Furthermore, such general support necessarily results in the benefits being presented at national engineering meetings where the educational value will be of greatest moment.

Under a cooperative research plan, the cost to each participant may be quite nominal compared to the cost of doing the same work under the sole sponsorship of one organization. For this reason alone, the system is efficient. In addition, efficiency results from a general sharing of the fruits of basic applied research.

While it is not the purpose of basic applied research to develop patents, yet if these do result, as they surely may, they become the property of all members of the group. The main outgrowth of the work, however, is the stimulation of new applications, products and processes in the private plants and in the laboratories of the industrial concerns themselves.

Basic Applied Research in the U.S. Has Not Developed As Fast As in Other Countries. As pointed out in the case of the AISI, American industry believes in the free enterprise competitive system to a degree beyond that now found in Great Britain. Yet in both America and Britain there is a trend in the direction of cooperative industrial support of basic applied research. But in Britain, this has forged ahead much faster and is supported by government as well as industry.

The American system has produced a degree of industrial development unparalleled even by that in Britain. American engineers and production experts have shown the world how to mass produce with minimum labor. But in one respect America has not excelled. The nation has failed even now to be farsighted in its attitude toward research. Generally, most industry in this country has concentrated its technical efforts in the areas of product and process development and quality control for mass production. In the areas of fundamental research and basic applied research, the Germans, British, and Italians have in the past been the world leaders. In fact, a great deal of our development work has benefited from the basic work done abroad.

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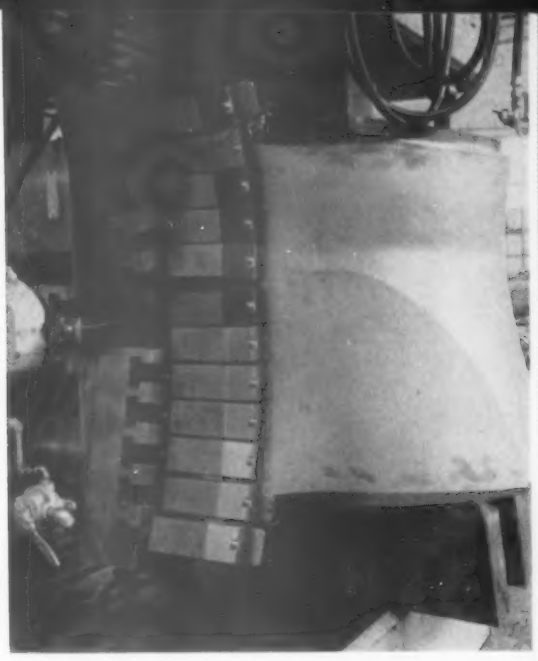
Vise Jaws Reduce Stretching Costs

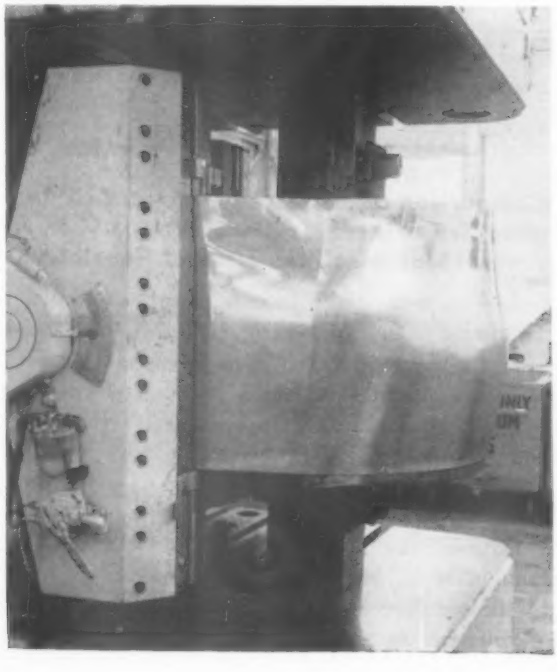
By John Starr



WITH THE FLAT-LIPPED vise-type jaws normally used in stretch forming sheet metals, large quantities of stock materials are usually wasted. Each blank must be cut to a much greater length than is actually required to fabricate a part in order to avoid stresses that could rupture the metallic materials, due to differences in the contours of the press jaws and stretch dies.

With Kindelberger jaws, originated by J. H. (Dutch) Kindelberger, North American Aviation, Inc., it is estimated that material costs essential to stretch forming operations have been reduced about $300 daily in a single aircraft plant because the only materials that must be wasted are relatively narrow strips extending beyond a specified trim line for each part.

Picture at upper right is closeup view of newer Kindelberger jaws completing a stretch-forming operation. Below is a stretch press equipped with flat-lipped vise-type jaws. Although the sheet being stretched is extra-long, undesirable forming stresses have been developed, as indicated by wrinkles in the sheet.



Kindelberger jaws are assemblies of small jaw segments, configurations of which can be varied in accordance with the contours of a stretch die. As they were initially developed, the jaw segments had to be bolt-assembled in line with the contours of a die prior to each production run. Because this required considerable set-up time, the design of the jaws has been improved recently so that each segment will automatically swivel to the proper position after it is loaded, due to applied forming pressures.

Table 1—Typical Material Savings

(Based on Alclad, 24 ST, 0.040-inch thick)

Blank Dimensions for Standard Jaws (inch)	Blank Dimensions for K'berger Jaws (inch)	Difference in Blank Areas (sq. inch)
18 x 140	18 x 114	468
26 x 79	26 x 74	130
24 x 129	24 x 124	120

A single hydraulic valve and appropriate linkage enable all segments of each jaw assembly to grip the end of a sheet metal blank in one operation. Materials fabricated by means of the jaws include aluminum, magnesium, steel, titanium, and other sheet alloys in all of the thicknesses that can be used to stretch form parts with conventional press jaws.

In preparing blanks for operations involving the use of these jaws, it is assumed that all portions of each blank will be utilized, except for a three-inch strip on each of two edges which must be gripped by the jaws and a one-inch strip on each of the remaining edges. No basic variations in the designs of standard stretch presses and dies are required.

Statistical Evaluation of Rational and Stratified Methods of Sampling

By Dr. James V. Strela
STAFF STATISTICIAN
THOMPSON PRODUCTS, INC.

Part IV

THE THOMPSON sampling machine was described in Part I (Fig. 1). The same machine is now used to secure a distribution pattern of a larger sample of values by raising the right leg of the machine about 1.75 inches. The sample itself is not analyzed, but an analysis of 1,000 values produced under similar conditions is presented in *Fig.* 6 in which samples of 1,000 values each from this machine when operated under two other conditions are analyzed. The processes represented by the operation of the machine under the three conditions are referred to as the processes A, B and C.

The purpose of presenting this figure is to illustrate a shift in the level of operation of the process, the standard of which was established by the analysis of the huge sample of 5,000 values presented in Fig. 2. For practical purposes, let this figure represent the production of values by an operator working to the lower specification limit rather than to the specification mean. Better still, let the figure be a reminder of the fact that while the original standard, $\overline{X}' = 0$, $\sigma' = 3.5$, established from the operation of the machine when it was run under the condition *A* (on the horizontal plane), may change considerably if the process is operated under the conditions *B*, or *C*, even if the physical condition of the machine, the composition of the material, and the man associated with the process, remain unchanged. The main idea here is to develop a method of process sampling suitable for the detection of the changes such as illustrated by the pattern in the figure. The original process may undergo changes in the following three ways: (1) The level of operation $\overline{X}'$ may shift. (2) The process variability ($\pm 3\sigma'$) may change, usually for the worse, unless radical change of the process is effected (major repair of the machine). (3) The change in the level of operation may be accompanied by the change in the basic variability of the process (effect of tool wear).

In the subsequent figures, the results of the conditions mentioned are recorded and analyzed.

Comparison of Rational and Stratified Sampling from Three Distinct Process Components, (Statistical Universes of Populations)

In Fig. 6 the three process component distributions analogous to those considered in Fig. 2 consist of a thousand values each from the Thompson sampling machine operated under the following three conditions: (1) On the horizontal plane—component *A*. (2) Right leg of the machine raised 1.75 in.—component *B*. (3) Left leg of the machine raised 2.75 in.—component *C*.

However, the three process components should be thought of as, for example, 3,000 values produced by three different operators, either on the same or on different machines, tooling, set-up, etc. But they

may also be thought of as material received from three distinct sources. Or, to tie this figure in with the preceding discussion, these three process components may represent the values produced on the same operation as a result of two sudden shifts from the level of operation of the process represented by the component distribution *A*.

The three sets of a thousand values each were posted into 40 rows of 25 values, so that by calculating averages and ranges of these rows of values, rational samples are secured in which the time sequence of value occurrence is preserved, whereas by calculating the averages and ranges of the 25 columns of 40 values, stratified samples result in which the element of time is destroyed. It is now to be shown that as long as the samples come from the same stable component source, it is immaterial whether they are assembled in the rational or stratified manner, whereas if sample values represent various process components, there may be a considerable difference in results. The left portion of the figure illustrates the rational method of sampling; the right side of the picture shows the stratified method of sampling of the three sets of values under consideration.

Analysis and Interpretation of Data in Fig. 6

Since the three sets of a thousand values each are identical for both the rational and the stratified methods of sampling, their mean values, $\overline{\overline{X}}$, are also identical for both methods of sampling; they are represented by the three solid lines running through the three sets of $\overline{X}$ values of the 40 rational and 25 stratified samples, the sources of which are identified by the three distinct symbols. These averages are complemented by the $3\sigma_{\overline{X}}$ limits about their grand average, $\overline{\overline{X}}$, calculated from the σ'_r based on the respective sample sizes and the values of the three average ranges, $\overline{R}$, which are also shown as solid horizontal lines in the bottom portion of the figure.

Although the statistical tests of significance of the differences between several means are not presented, such tests would definitely reveal the levels of operation represented by the process averages of the components *B* and *C* to be significantly different from the $\overline{\overline{X}}' = 0$ of a process which in this figure is represented by the process component *A*. However, the story of the respective average ranges is quite different; they are relatively uniform.

To be sure, the three $\overline{R}$ values of the 25 stratified samples of 40 values are larger than the $\overline{R}$ values of the three sets of 40 rational samples of 25 values; however, that difference is the consequence of the difference betwen the sample sizes and should not be attributed to the two methods of sampling. It is to be noted that the three values of $\overline{R}$ in both methods of sampling show the same ascending order of magnitude: $R_A < R_C < R_B$, which fact, if supported by similar further sampling, would suggest that the interference with the original process, such as induced by raising the legs of the sampling machine, resulted in the greater variability of the process *B* than of the process *C*.

The final analysis of the conditions illustrated in Fig. 6 is presented in another chart. To conclude the analysis of this figure, it can be stated in ad-

TABLE 2—Factors for Determining from σ', $\overline{R}$ and σ of *m* subgroups of *n* Values X the 3σ Control Chart Limits for Values *R* and σ

Chart for:	R				σ			
Est. from:	σ'		$\overline{R}$		σ'		$\bar{\sigma}$	
Factor	D_2	D_1	D_4	D_3	B_2	B_1	B_4	B_3
n 2	3.686	0	3.268	0	2.064	0	3.658	0
3	4.358	0	2.574	0	1.948	0	2.692	0
4	4.698	0	2.282	0	1.859	0	2.330	0
5	4.918	0	2.114	0	1.789	0	2.128	0
6	5.078	0	2.004	0	1.735	.003	1.997	.003
7	5.203	.205	1.924	.076	1.690	.086	1.903	.097
8	5.307	.387	1.864	.136	1.653	.153	1.831	.169
9	5.394	.546	1.816	.184	1.621	.207	1.774	.227
10	5.469	.687	1.777	.223	1.594	.252	1.727	.273
11	5.534	.812	1.744	.256	1.570	.290	1.688	.312
12	5.593	.925	1.717	.284	1.548	.324	1.654	.346
13	5.646	1.026	1.692	.308	1.529	.353	1.625	.375
14	5.693	1.121	1.671	.329	1.512	.378	1.599	.400
15	5.737	1.207	1.652	.348	1.497	.401	1.577	.423
CONTROL CHART FORMULAE								
(1) Central line	$\overline{R}' = d_2\sigma'$		$\overline{R} = \Sigma R/m$		$\bar{\sigma}' = c_2\sigma'$		$\bar{\sigma} = \Sigma\sigma/m$	
(2) U. C. L.	$D_2\sigma'$		$D_4\overline{R}$		$B_2\sigma'$		$B_4\bar{\sigma}'$	
(3) L. C. L.		$D_1\sigma'$		$D_3\overline{R}$		$B_1\sigma'$		$B_3\bar{\sigma}$
The above factors are based on the normal distribution								

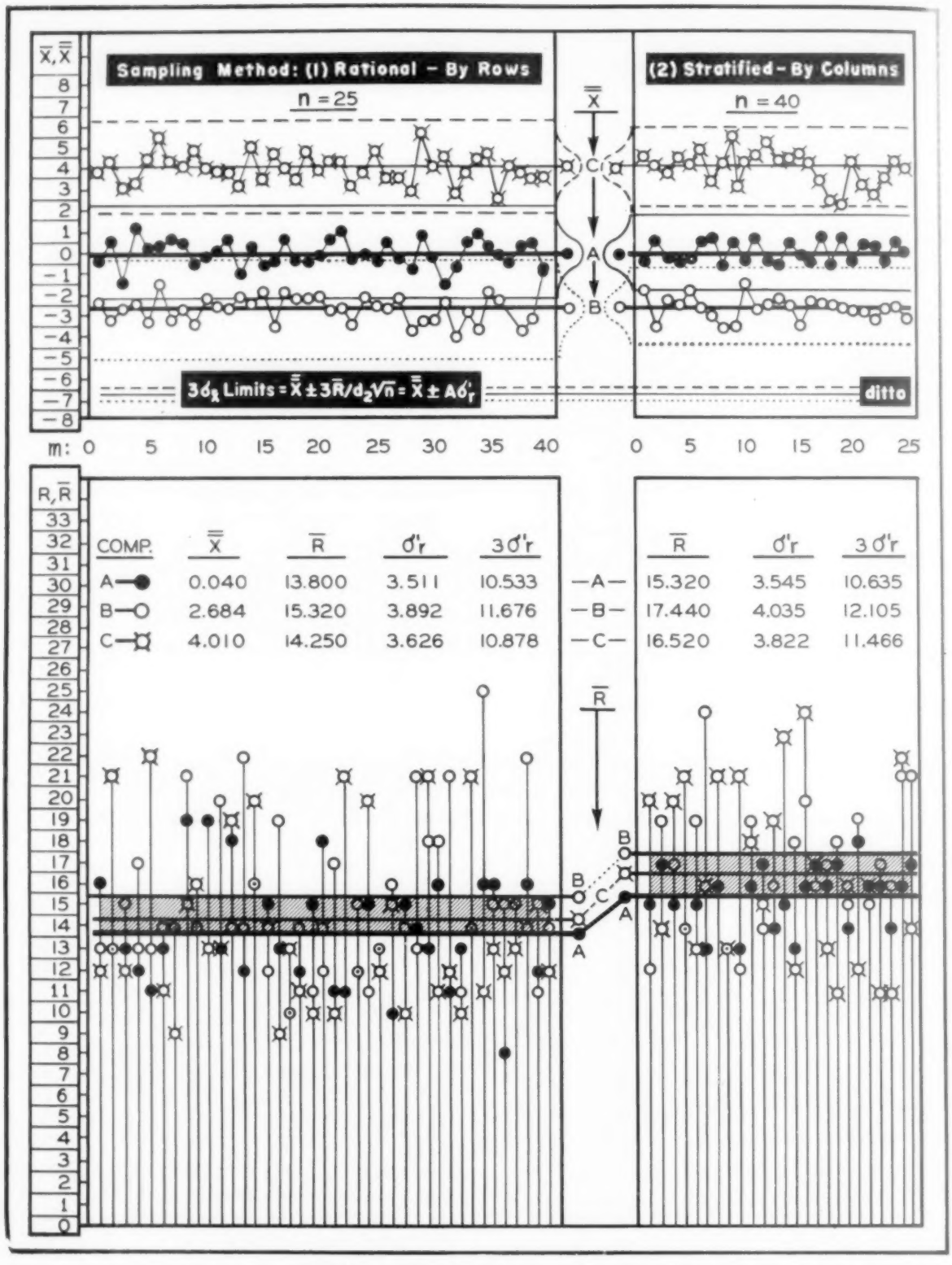


Fig. 6. *X, R* **charts of** *m* **rational and stratified subgroups of n values X from three distinct process components. (Statistical universes or populations) The 1000 values for each component were taken from the Thompson sampling machine under the following conditions: Component** *A* **- on the horizontal plant; Component** *B* **- right leg of the machine raised 1.75 inches; Component C - left leg of the machine raised 2.75 inches.**

vance that the estimates of the percentages of the values produced by the three component distributions within the assumed quality specifications, 0 ± 10.5, are practically identical for both methods of sampling. In short, if these component distributions are viewed as three cakes made from different

doughs, the variability of each cake structure may be tested equally well by a horizontal as well as a vertical slice. However, such is not likely to be the case with a layer cake in which three kinds of dough are superimposed on one another in a repeated sequence. That situation is considered in the figure that follows.

Fig. 7 represents the same information as the preceding figure, except that it represents a process so composed that it may be viewed as approximately one-third of the combined 3,000 values of the components *A*, *B*, and *C*. The process called *D* may be viewed as the layer cake just mentioned, or better still, as 1,000 dimensional values from a three-spindle machine, each of which operates on a different level. The other analogies mentioned in connection with the complex processes would be equally applicable to this process. In short, the situation illustrated is anything but academic.

It is to be noted that the three symbols used for the averages and ranges of the rational samples are identical with those in Fig. 6. Actually, they are the averages and ranges of the same rows of the 25 values charted in the previous figure, except for the fact that two-thirds of them are omitted. In other words, the process *D* is composed of 40 layers of strata of dimensional values produced by three distinct sources of variation, called the components or subprocesses, *A*, *B*, *C*, such layers repeating themselves in the same sequence. Although the averages and ranges of these rational samples are connected so as to form a continuous graph, the identity of their respective three sources or parent populations of the *n* values is preserved by the three distinct symbols used to describe them. However, the averages and ranges of the 25 stratified samples charted in the right upper portion of the figure are shown in a new symbol to suggest the complex composition resulting from the three mixed sources of variation.

Analysis and Interpretation of Fig. 7 Data in Respect to the State of Control

Note that two-thirds of the averages of these rational samples are outside the $\overline{\overline{X}} \pm 3\sigma_{\bar{x}} = \overline{\overline{X}} \pm 3\sigma'_r/\sqrt{n}$ limits of variation, due solely to chance causes characterizing the three unmixed sources of variation; as inferred above, the variability of the three sources *A*, *B*, *C*, was not expected to change because of the shifted level of the component distributions.

In this case, the figure does not portray a gradual shift in the respective component levels of operation; rather, it indicates a sudden, and considerable, shift, such as frequently occurs on machining operations due to tool chip or tool slip. Still, the conditions presented are fundamentally the same as those indicated in Fig. 3 illustrating the continuous trend. This rational method of sampling, in which the sources of data are properly identified, reveals quickly the identity of the components operating on the undesirable levels of operation. Consequently, the $\overline{X}$ chart operating with the rational samples would immediately indicate the necessity of bringing the levels *B* and *C* to the level *A* to reduce the actual variability to the potential variability of this process if all its components operated on the same level.

It is to be noted that all 25 averages of the stratified samples show excellent control in respect to their control limits and that their variability about their grand average value 0.227 is very small in comparison with the variability of the 40 averages of the rational samples about the same process average. To be sure, the averages of samples of 40 values are expected to show smaller variability than those of only 25 values; nevertheless, the very small variability of these stratified samples is chiefly due to the fact that about one-third of their values comes from a process component centered at zero; one-third comes from a process centered near the value minus 3; and one-third comes from a process component centered at the value 4. As a result, the average value of these samples does not depart appreciably from the value zero; for the high values from the component *C* are counterbalanced by the low values from the component *B*. In other words, judged merely by the pattern of these averages, the situation they suggest looks promising. None of the averages comes even close to the three sigma control chart limits, let alone exceeds them. And yet, if the composition of these samples is recalled, it will be noted that they come from the process *D* which is characterized by greater variability than that of any of its three component parts.

Since the control chart for averages serves the purpose of revealing the variability from subgroup to subgroup of sample values and not within them, obviously it is necessary to look to the chart for ranges to throw light on the reason for this perfect state of control of the averages under consideration; for those $3\sigma_{\bar{x}}$ control limits are based on both the value $\overline{X}$ and $\overline{R}$ of this process *D*. Two aspects of the sample ranges should be of interest, their state of control and their magnitude.

Because of the unsuitable sample size in excess of 15 values, factors D_4 and D_3 needed for the $3\sigma_R$ control chart limits are not available; however, the graphic portrayal of these ranges suggests a good state of control and thus a pattern of variability resulting from the operation of a stable system of chance causes of variation characterizing the previously analyzed component distributions *A*, *B*, *C*.

As for the magnitude of these ranges, it can be judged only in relation to something else; the terms

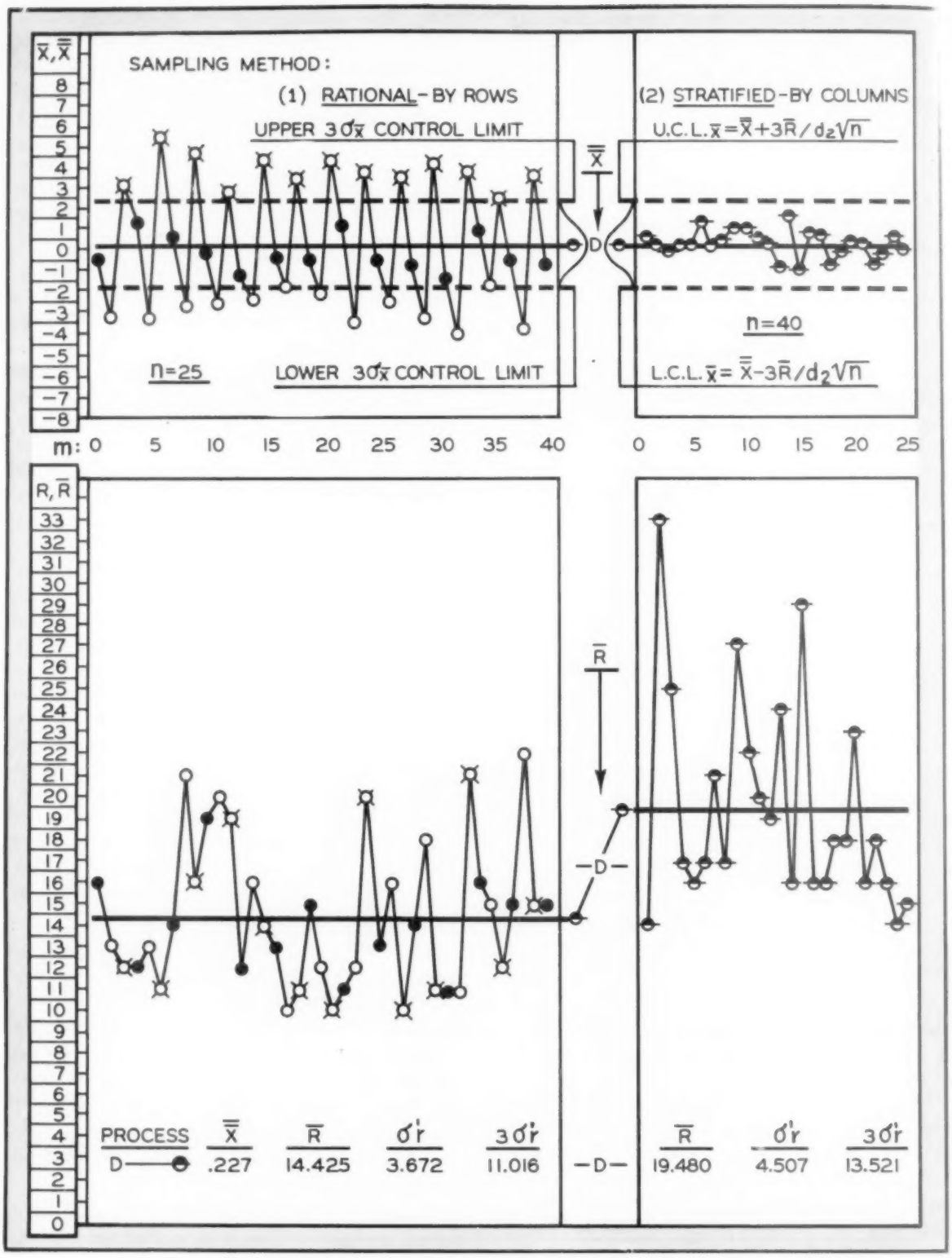


Fig. 7. $\bar{X}$, R **charts of** m **rational and stratified subgroups of** n **values** X **from three distinct process components. (Statistical universes or populations) The information presented here is the same as that in Fig. 6, except that it represents a process so composed that it may be viewed as approximately one-third of the combined vales of components** A, B **and** C.

small and large are relative. In respect to the assumed quality specifications, 0 ± 10.5, these ranges are too large. On the other hand, since in quality control the process capability represented by the $\pm 3\bar{R}/d_2$ is estimated on the basis of the $\bar{R}$ of a process indicative of a state of control, such as sug-

gested by this chart, these ranges are likely to be viewed as representative of the minimum variability to be expected of the process *D*. Yet a look at the very much smaller value $\bar{R}$ of the rationally sampled identical 1,000 values suggests that perhaps the method of sampling is the assignable cause of the state of control of these ranges of the stratified samples and of their much greater magnitude. This is really the case, for the ranges of these stratified samples reflect the variability resulting from two causal systems of variation: chance causes, characterizing each of the three process components; an assignable cause, characterized by the three distinct levels of operation of these process components.

The result of such combined causal systems of variation must be expected to increase the variability of the process in which both causal systems are permanently represented. In turn, this permanence of the two causal systems, and the perfect mixture of the 40 values from them, are responsible for the complete obliteration of the evidence of the presence of two causal systems of variation. It is this fact that is responsible for the indication of a perfect control of both these averages and ranges of the stratified samples from the combined process *D*. In other words, in this process, the two causal systems of variation are mixed into a single causal system of chance variations.

Without going into statistical details, let it be stated that averages even from the so-called triangular or rectangular distributions still distribute normally, and that the ranges of the sample values from such distributions also show a regular pattern of distribution. In short, the evidence of the control chart alone must always be viewed against the method of the sample selection, especially when such samples originate from such complex processes as illustrated. The $\bar{R}$ of stratified samples from such processes is likely to make the control chart for both averages and ranges insensitive to the detection of the various levels of the component distributions. Such sampling is also likely to become insensitive to the detection of the varying dispersion about such process component levels of operation.

(Continued Next Month)

JIC Standardizes Mechanical Presses

At the recent Joint Industry Conference on mechanical presses, held in Chicago on September 17 and 18, both manufacturers and users discussed the progress of the standardization work to date and its advantages to industry. About 70 people attended the conference. The Verson Allsteel Press Co. was host to the group and arranged an inspection trip through its plant. Future conferences are being planned to cover gap frame presses, triple-action presses, welding presses, etc.

Recognizing the need for standardizing mechanical presses to facilitate interchangeability and maintenance, this program of standardization and simplification was begun in 1946 and has been continuing through open forum discussions. These joint industry conferences, consisting of users and builders of presses have resulted in the formulation of standards for tonnage ratings, platen sizes and mountings, strokes, slides, bolster plates, bolster bolts, cushions and clutches.

Types of presses for which the standards have been developed include: open-back inclinable; straight-side, single-action, single-point and multiple-point; rail or frame; double-action single- and multiple-point; and triple-action multiple-point presses.

The conference standards are similar to those formulated by other JIC groups on electrical, hydraulic and pneumatic equipment for production machines. All these standards have the same objectives: increased safety of operation, flexibility of application, ease of maintenance, and dependability in service.

Progress to date of this standardization program includes standard tonnages, exerted by main slides of 75, 100, 125, 150, 200, 250, 300, 400, 500, 600, 800, 1000, 1250, 1600 and 2000. The numbering system for presses is composed of four divisions. In order each designates the action, the number of points of pressure application, the tonnage and the area of the bed.

Bolster plates are to be cast iron or 1020 steel and are located by dowels of fixed dimensions and centers. T-slots and pressure-pin holes are to be of definite size and pattern. The slide and bed are to have the same dimensions and the main slide has the same arrangement of T-slots as the bolster. On all presses other than gap, the slideways are to be contained in the gibs at both ends of stroke. Removable hardened steel wear plates are to be mounted on top of the pressure plates.

Anyone interested in attending these Joint Industry Conferences may obtain information from R. R. Mitchell, 3044 W. Grand Blvd., Detroit 2.

Mobile Lab Expedites Gage Checking

By bringing the lab to the plant, inspection of gages becomes an overnight operation instead of a one to six months time problem, depending on the type and use of the gage. Designed by the Gage Engineering Division of Detroit Arsenal, this mobile temperature-controled gage inspection laboratory can be shuttled between the several contractors' plants in an Ordnance district. It is equipped with necessary instrumentation to perform surveillance inspection of final inspection gages used by the resident inspector in the acceptance of Ordnance material.

At the present time it is necessary to ship government gages into a centrally located laboratory periodically. In many districts, a building is rented as a sublaboratory to take care of manufacturers in that area. Many times production has been hampered seriously because of the time consumed in shipping gages for inspection.

This mobile laboratory is composed of standard units and equipment insofar as possible. It is housed in a standard commercial six-ton trailer and is 26½ feet long, 8 feet wide and 11½ feet high. The floor is approximately four inches thick, two inches are cork and another one and an eighth inches are oak insulating paper. Insulation is continued on around the trailer with the side walls covered with three inches of Ultralite, a non-sagging insulation, and two layers of plywood. Three to five inches of the same insulation and one-quarter inch plywood are utilized in the ceiling.

Heating units and cooling equipment insure the 68 F temperature necessary in the laboratory that works indiscriminately through a range of temperature from 20 degrees below zero to 120 degrees above. Trailer and equipment are operated on 110-volt 60-cycle current obtained by plugging into the factory outlet wherever the unit is stationed.

The gage laboratory contains all the basic instruments for checking gages, and each Ordnance district adds supplementary special equipment as required. Major instruments included are a length measuring machine 48 inches long and accurate to 0.00010 inch; a contour optical projector with both vertical and horizontal light projection and surface illumination in color, which projects ranges from 10 to 100 magnifications. An internal measuring machine measures inside diameters with an accuracy of 0.000050 inch; another gage measures surface finish to 0.1 microinch. A set of cylindrical plugs in increments of 0.001 inch vary in size from 0.030 to 0.5 inch.

Each instrument has a special place, cabinet or container in the trailer for its protection. Up to the present no instrument has been damaged, although one trailer, for example, has traveled more than 2,000 miles.

Photo above—the mobile gage lab ready for work. Rudolph Spall, who designed the unit, stands at the extreme left, with Lt. Col. A. N. Bray, chief, Inspection Division, and Maj. M. D. Crowell, chief, Gage Engineering Divisions.

Below, Duane Stone, foreman of the gage lab demonstrates the equipment for Maj. Crowell.

Skip Welding

Ring Gear to Flywheel

By Herbert Chase

ONE OF THE MAJOR components of the Packard ultramatic transmission is the flywheel to which the pump of the torque converter is subsequently attached. This flywheel assembly seals the front of the converter housing and, of course, also serves as the flywheel of the engine. Two components, a circular stamped plate and a ring gear, with which the starter pinion meshes in service, constitute the flywheel.

To produce the ring gear, ½-inch square steel bar stock is rolled into a ring and its ends are joined by resistance butt welding. Then the ring is trimmed of flash, expanded and heat-treated, after which the ring is machined all over and teeth are cut. Ring ID is held to 15+9.002 —0.005 inch.

This ring is subsequently pressed over the flange of the stamped wheel, or web which is ⅛-inch thick and has its OD turned to 15+0.002 —0.000 inch. An eight-ton press, *Fig.* 1, is used to press the two parts together; this operation is performed by the same man who loads and unloads the machine that welds the ring to the flange.

As *Fig.* 2 indicates, this machine is equipped with a horizontal circular air clamping fixture attached to the circular indexing table. Above the table are an automatic welding head and control panel and at the right is the button by which the machine is started on its automatic welding cycle. Included in the head is a hopper from which No. 780 granular flux is fed automatically to cover the arc.

Mild steel, L-60, wire of ⅛-inch diameter is fed automatically from a reel mounted at the left side of the machine. Welding current is supplied by a 600-amp welding generator mounted on an overhead platform. Loading of the fixture is done by

Fig. 1. Using an 8-ton air operated machine to press a ring gear over the flange of a stamped flywheel web. As one button must be pressed with each hand, both hands are in safe position when the press closes.

hand, the workpiece being centered over a boss at the center of the fixture, air-clamped at the edges by three jaws and then covered by a spider that is held down by screwing on a capstan nut, *Fig.* 3. This rigid clamping helps to avoid warpage that

might result from the welding which follows immediately.

Welds are not continuous but consist of beads, each about 1½ inches long, laid down around the circle where the flange of the stamping and the ring gear come together. This circle, of course, is outside the spider clamp and inside the air clamping jaws. Eight welds, equally spaced around the circle, are made but not in regular sequence.

After the first weld, the workpiece is automatically indexed 180 degrees so that the second weld is diametrically opposite the first. The second indexing is only 45 degrees but the third is 180. Subsequent indexings are 45 and 180 degrees until all eight welds are completed. By skipping in this fashion, warping tendencies are minimized and the assembly retains its circular form and flat faces within the limits specified.

Since welds are equally spaced and substantially uniform in length and volume of metal added, any tendency toward unbalance is minimized, although the pieces are subsequently balanced dynamically. Feed of flux to welds is automatic and ceases during indexing. Flux next to welds is fused but the excess remains granular and falls into the annular trough surrounding the fixture, and any that remains on the fixture is brushed off by hand before the next piece is loaded. Fused flux is easily removed from each assembly after it is removed from the fixture.

Attached to the rotating table is a scraper that swings around the trough. Flux is moved around by the scraper until it feeds out through a hole and

Fig. 2. Fixture is loaded and a skip weld in process on this Expert welding machine which uses a Lincoln head, control panel and generator. Flux covers the arc; hence, the operator need not wear a mask. Operation is automatic after loading and starting the machine.

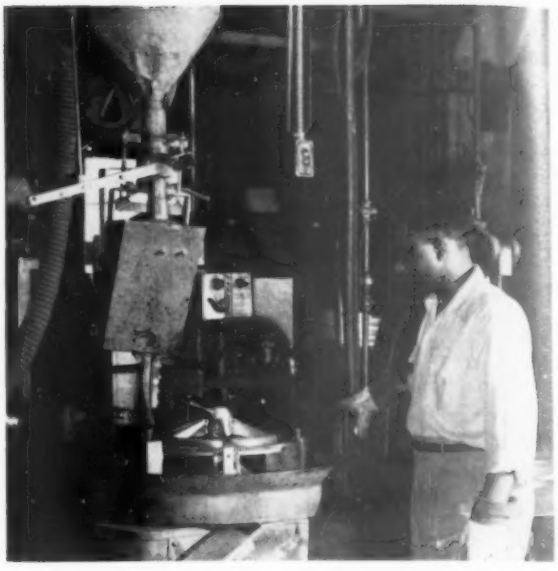


Fig. 3. This view of the equipment shows the reel of wire at left center and the upper and lower flux hoppers.

down the chute, in the left foreground of *Fig.* 3, and onto an inclined vibrator screen. Unfused flux falls through the screen and is picked up by a vacuum system that delivers it to a larger hopper well above the machine, *Fig.* 4. And lever that operates a valve below the large hopper is lifted whenever the smaller head hopper below it needs filling. Particles of fused flux, that fall off with granular flux and are too large to pass the screen, slide down its top face and are collected to be scrapped.

After welding is completed on a flywheel, current is automatically shut off, the electrode is retracted and the weldment is unclamped. It is then laid on a roller conveyor next to the machine, after which the fixture is brushed off and reloaded. An average welding rate of about 30 flywheels an hour is attained in this machine.

In *Fig.* 5 is shown some of the mechanism below the table of the machine. It includes a motor that drives a sheave with V-belt through a reduction gear. In turn, the latter drives a cam that performs the indexing of the table carrying the fixture. Operation of the drive mechanism and the head involves interlocks that cause the head to feed down and make a weld after each indexing is completed and to retract when each weld is completed.

This makes the machine semiautomatic; the operator performs only the loading, starting and unloading operations in addition to an occasional lifting of the valve to fill the head hopper. While the machine runs through its welding cycle, the operator has time to press a ring gear over the next stamping to be welded, using the press shown in *Fig.* 1.

Finish Grinding

Troubles and Remedies

By A. W. Todd
CHIEF ENGINEER VAN NORMAN COMPANY

Part II

THE MOST IMPORTANT function of a coolant is to flush away the material being removed, to keep the wheel clean and to keep the temperature of the work uniform rather than to keep it low. Usually, it is best to hold the temperature of the work as near to room temperature as possible. In some cases refrigeration is essential, preferably with automatic thermal control. Magnetic coolant separators are used to remove small metal particles and other foreign

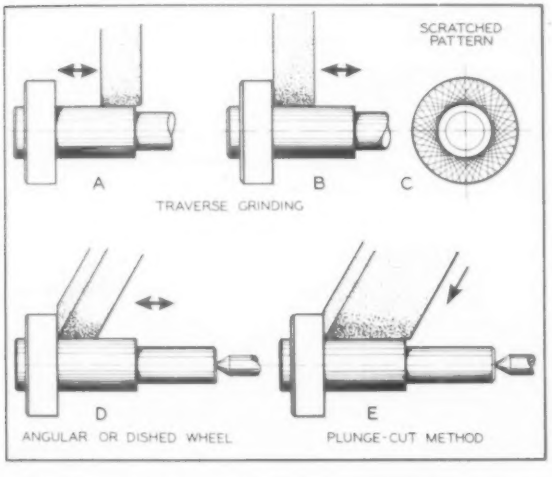


Fig. 5. Drawings clarify the comparison between traverse and plunge-cut grinding.

matter so that they will not mar or scratch the surface of the work.

In applying coolant to grinding operations, the volume supplied is far more important than the pressure. The volume depends on the type of job performed, but on an average, a flow of five gallon per minute for each inch of wheel face will be found satisfactory. Any lack of coolant will result in excessive heat and cause out-of-roundness of the work.

Choosing Method of Grinding. The most common method of grinding a journal and shoulder is to use a straight wheel, traverse up to the shoulder, then face grind the shoulder with the side of the wheel as illustrated in Fig. 5 at *A* and *B*. With this procedure, the face of the shoulder is ground with a series of reverse arcs, or scratch pattern, as at *C*, which could be objectionable as a thrust bearing surface. An improved method is to use a dished wheel or a wheelhead set at an angle, as at *D*, in combination with traverse to the work. The shoulder face is then ground with a concentric pattern and likewise much smoother. A better approach for such an operation is to plunge-cut grind the journal and face simultaneously, as at *E*, having the wheel set at an angle of 20 deg to 30 deg or more, depending on the area of the flange being ground.

Plunge-Cut Grinding

Plunge-cut cylindrical grinding has many advantages over traverse grinding. In the traverse method, the edges of the wheel do most of the cutting. The wheel therefore breaks down first on the corners, causing a crown to develop on the wheel face. Then, if the wheel is not dressed frequently enough, the workpiece might be ground with a high

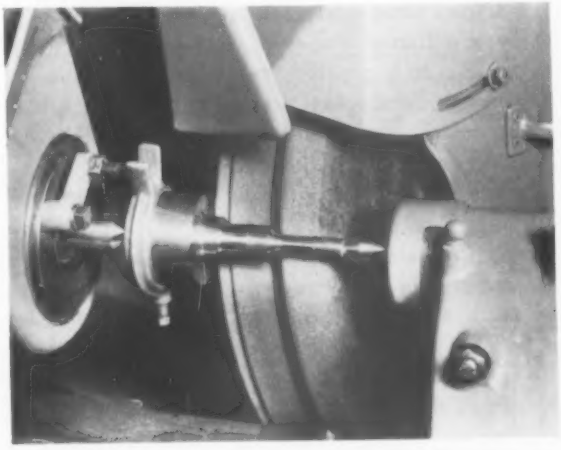


Fig. 6. Here is shown a machine plunge-cut grinding a spindle with two spacing wheels.

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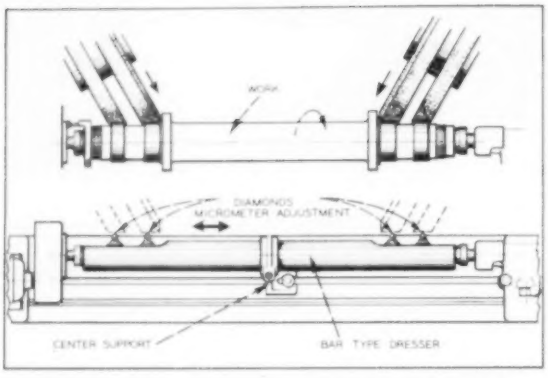


Fig. 7. Diagram pictures relation of wheels and ground surfaces during plunge-cut grinding a tubular axle with two spaced wheels.

spot at each end and with a hollow running in a spiral path across the center portion. If the surface being ground is a journal, a poor bearing may be produced. If the journal being ground is to receive an anti-friction bearing, the contact area between the bore of the bearing and the shaft is apt to have misalignment. Therefore, to assure the bearing remaining in place, a tighter press fit is the common remedy.

The crowned wheel, common to traverse grinding, aggravates grinding checks or cracks on the ground surface. Since the grinding is being done by the edges of the wheel, the center of the wheel is left without sharpness to fracture the abrasive or the bond; therefore, that portion of the wheel becomes excessively dull, contributing to burning and cracking.

Plunge-cut grinding provides considerable relief for these problems and, in many instances, is a satisfactory solution. Better wheel life can be expected from plunge-cut grinding because the cut is evenly distributed across the entire periphery of the wheel. It is possible to realize reductions in wheel costs from plunge-cut grinding, but often far greater cost reductions are made possible in direct labor through reduction in grinding time.

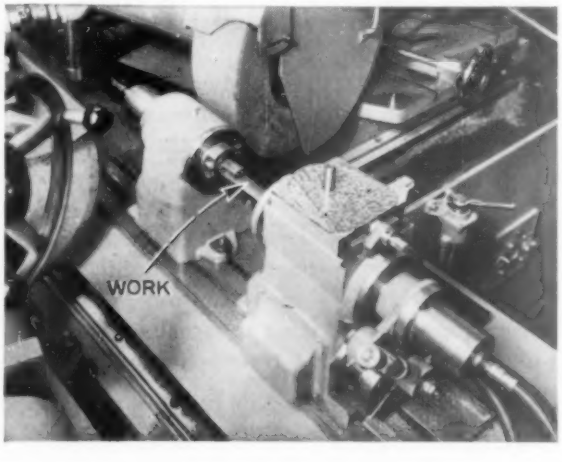
A typical plunge-cut grinding operation is shown in Fig. 6. The part is a spindle on which two ball-bearing journals, a seal diameter and an adjacent face are ground simultaneously. Two speed wheels are used, with the wheelhead set at a 30 degree angle. This set-up combines two or more operations into one as compared to former methods. Contour dressing of the wheel is done by means of the hood-mounted truing device shown in Fig. 2, whereas the side face of the wheel is trued by a table-mounted dresser. Both dressers are hydraulically operated. The table dresser is of the swing type so that the diamond carrier can be swung back when not in use, thus permitting the unit to remain on the table at all times without interfering with the loading of the workpiece.

In Fig. 7 is shown diagramatically the relation of the wheels and surfaces being ground. The lower portion of the illustration shows the bar-type dresser used for truing the faces of the four wheels simultaneously. The bar is supported between centers and clamped to the table at the center by a bracket. The diamonds are mounted in micrometer mountings for precision adjustment. Dressing is obtained by traverse of the table in both directions. Single-purpose grinding machines of this kind assure closer relationships between ground surfaces, and are far more productive because of the multiple surfaces ground at one setting. The grinding time for a part of this kind with a metal removal of from 0.012 to 0.015 in. is approximately 20 to 25 seconds. Other than loading of the workpiece, the operation is automatic.

Another example of a special-purpose machine, using opposed wheel heads, arranged for grinding the leading and trailing edges of rotor blades used in jet engines, is illustrated in Fig. 8. The blade to be ground is held by guillotine jaws in the headstock and footstock which clamp on and align from the airfoil of the blade. The cycle, after loading, includes rapid advance to the grinding position, rapid approach of both wheelheads, oscillation of the blade, grind to size, retract wheelheads and the table to loading position. These functions are all automatically controlled and timed so that a blade can be ground in 15 seconds, floor-to-floor time.

In general, the trend in precisions grinding leans more to heavier, more powerful machines through which faster producing rates are made possible. Automatic features such as truing devices and sizing control are also finding broader use. Where production demands warrant, the special-purpose machine is increasing in popularity, especially plunge-cut grinders where one or more surfaces can be ground simultaneously. Crush dressing of wheels, where it can be applied, is also broadening in use.

Fig. 8. Opposed wheels are grinding leading and trailing edges of jet engine rotor blades.



Simplified Clamping Design

By S. Tilles

CLAMP DESIGN can be considerably simplified by breaking the problem down into a point-by-point procedure. First, the amount of clamping force required is estimated. The next step is to choose a method of applying this force to the workpiece. A mechanism for obtaining a mechanical advantage may be used, and a means for locking must be provided if necessary. In addition, provisions for protecting the surface of the workpiece may be required.

The reference table shown may serve as a guide in selecting the method for applying the necessary clamping force.

Method	Advantages	Disadvantages	Particularly Suited for	Remarks
Manual	Minimum investment in equipment No auxiliary facilities	Limited in force that can be applied Usually longer time required Tiring for operator More hazardous than other methods	Small production quantities Small force requirements	This method is frequently advantageous for small quantity lots
Pneumatic	Relatively inexpensive (less than hydraulic) Rapid action Ease of operation Uniform application of pressure Simple design	Drop in pressure may cause work to loosen Failure of air supply causes all fixtures to be inoperative	Medium forces Space requirements not critical High cycling rate High temperature applications	12-in. bore cylinder will produce about 11,000-lb force in 100 psi line
Hydraulic	Failure of one unit does not affect others Ease of operation Uniform application of pressure Simplified design	Expensive—at least 10-20 percent more than pneumatic Requires considerable amount of auxiliary equipment if machine is not hydraulically operated	Large force requirements Restricted space Average cycling Normal temperatures	Pump may deliver oil at pressures up to 1000 psi
Magnetic	Rapid action Extremely simple design Very adaptable—same chuck may have wide range of application	Holding force limited Fairly high initial cost Size of chucks limited	Parts having high proportion of plane surfaces Operation involving small cutting forces Fairly small parts (one ft or less)	May be purchased in either electric or permanent magnet type
Adhesive	Inexpensive Rapid	Holding force small compared with others Restricted to parts that can be held on a large flat surface	Grinding or other operations requiring small forces Flat, thin parts Rectangular and nonmagnetic parts	If coolant is used, protective coating must be placed on adhesive Both table and part must be wiped clean

Blind Broaching Method Increases Production

AN OIL-HYDRAULIC PRESS setup installed at the National Acme Co., Cleveland, has resulted in production gains on a job of blind broaching internal serrations in a circular thread chasing tool. The rate of production has been increased by three and one-half times the output attained by the former method, an arbor press requiring sufficient hand and arm strength to force the broaching tool into the part. With the all-manual method eliminated, the element of safety is much greater, and operator fatigue has been reduced to a minimum. Unskilled labor can successfully produce the parts more accurately and with a higher uniformity, resulting in considerable savings in scrap losses and labor costs.

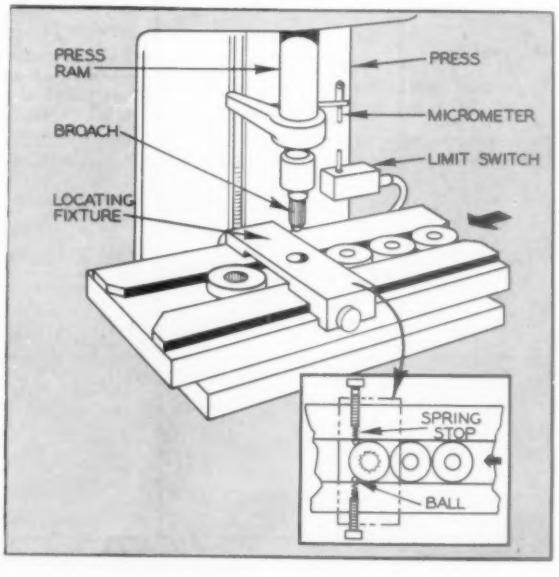
This press setup is an eight-ton Multipress equipped for vibratory action and controlled by a foot pedal. The vibratory strokes are controlled by special valving which provides automatic cycling and vibratory repeat strokes. The length and number of the repeat strokes can be regulated. Since it is imperative that the broach does not hit bottom, a micrometer stop with a precision limit switch is mounted on the throat of the press. With this combination of micrometer stops for reversal of the repeat strokes, the press uses only one ton of force.

Before coming to the press, the parts are cut to the desired thickness, drilled, countersunk and faced. The 1341 high-speed steel is then painted with white lead and cutting oil. After the press operation, the parts are hardened and the thread grooves are ground to make a finished tool.

The tooling setup on this press is a straight channel underneath the ram, having two spring-loaded stops, allowing the part to be pushed through after it is broached. This arrangement has adjustments on both ends, front and back, in which to adjust the spring tension. This insures that the part will stop and be correctly positioned before the bottoming takes place with the broach. In the actual broaching operation, the part is placed in the channel or slot and moved by hand to a position against the two spring-loaded stops. This positions the part for processing. The operator then depresses the foot pedal, causing the ram to move downward, contact the work, and exert three vibratory repeat strokes. The ram then returns to the up position. After the cycle is completed, the broached part is pushed past the two positioning stops, which immediately snap back into place to locate the following part.

The circular ground thread chasers and circular hollow milling cutter manufactured in this process are used in the Vers-o-tool precision thread hollow milling operations. Four such tools are used on each head. These circular chasers are connected to a one-piece block pilot. A double serrated bushing allows the chasers to be set in advance, the minimum amount for each grind increasing the chaser life. This part can also have a grind and regrind of a full 270 deg in the chasers and couplers.

Fig. 1. Tooling set-up for blind broaching an internal gear on a hydraulic press.



Drilling Machine Classification

By Robert T. Kimmel

One of the most common metalworking operations is the production of a drilled hole which is smooth, accurate and straight. For this purpose a variety of machines have been developed and are usually lumped together under the generic heading of drilling machines or drill presses. The machines are widely different in appearance and construction according to the purpose for which they are designed. Drill presses can be classified in several ways. They might be segregated as to purpose, construction or design, or the manner in which power is applied. The simplest of these methods is construction and design, since under this heading, most of the other features are also covered.

In addition to drilling holes, the drilling machines can also perform tapping, reaming, facing, boring, counterboring, and countersinking operations, in most cases, by simply changing the tool. Tool engineers have designed intricate and elaborate machines which combine several of these operations as a unit. In other instances, the transfer machines for example, additional machining operations are included.

Although the small portable hand or power-driven drills are included in this category of machine tools, they will not be considered here. However, drilling machines range from these small portable drills in size to those drills which can handle workpieces weighing many tons. Throughout this range the principle of operation remains the same. The common mechanical feature of all drilling machines consists of a spindle revolving in a fixed relative position in a sleeve which does not revolve but which may slide in its bearings in a direction parallel to its axis. The power-driven spindle holds the drill or other tool and is advanced toward the workpiece either by hand or power feed. The spindle is usually in a vertical position except where the drill head unit has been positioned at a different angle in some of the more complicated types. Power is supplied to the spindle either through belts and pulleys or from a self-contained motor drive.

One source lists the following classification of drill presses and it is the one which will be followed here:

1. Sensitive drilling machines
   (a) bench mounting
   (b) floor mounting
2. Upright drilling machines
   (a) light duty
   (b) heavy duty
3. Radial drilling machines
   (a) plain
   (b) semiuniversal
   (c) universal
4. Gang drilling machines
5. Multiple spindle drilling machines
   (a) single unit
   (b) way or multiple head type
6. Automatic production drilling machines
   (a) indexing
   (b) transfer
7. Deep hole drilling machines
   (a) vertical
   (b) horizontal

Sensitive Drilling Machines

The distinguishing feature of this type of drill press is the feed which is manual. It is employed on light work and is rarely used with drills over $\frac{5}{8}$ inch in diameter. This type of drill revolves at high speed in order to attain the necessary surface speeds for efficient operation. Recommended feeds and speeds are given in The Tool Engineers Handbook for various materials. The manufacturer also usually has recommendations if the machine includes any special features.

The sensitive drill press consists of a table, the drill head and a vertical standard. In the bench type, the table is usually the base which is mounted on the bench. In the floor models, there is a base to which the upright standard is mounted. Dimensions for drill presses are usually given as the diameter of the largest circle at the center of which a hole can be drilled.

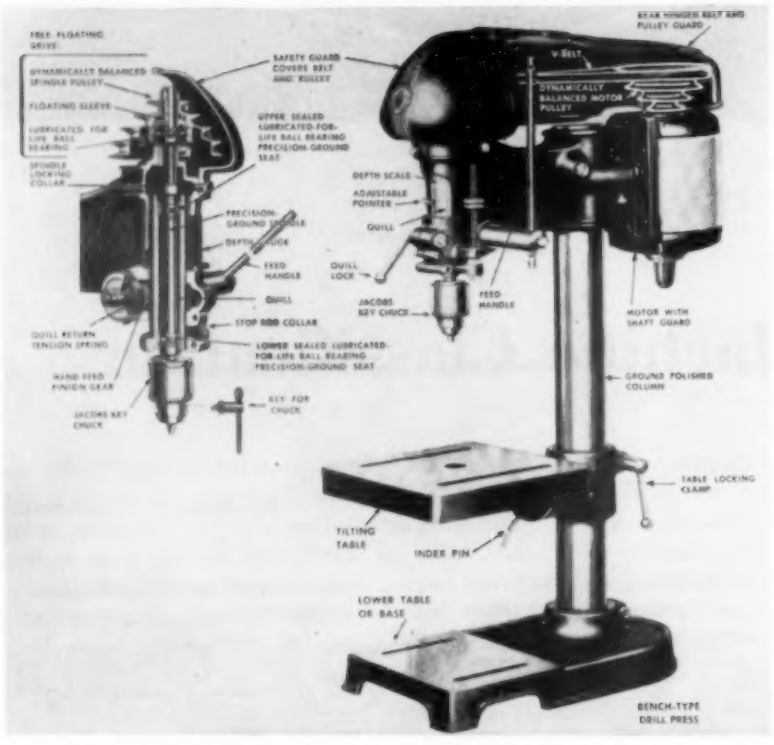


Fig. 1. The distinguishing feature of this sensitive 17-inch bench-mounted drill press is the hand feed. Made by Delta Power Tool Div., Rockwell Mfg. Co.

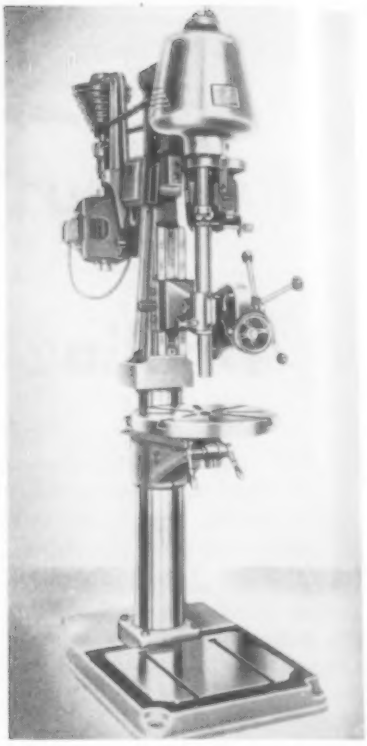


Fig. 2. Floor-mounted sensitive drill press made by Cincinnati Lathe and Tool Co.

In *Fig.* 1 is shown a bench-type drill press along with a cross-section of the drill head. *Fig.* 2 shows a 16-inch floor-mounted drill press of the same type. Both have depth scales and spring returns for the quill.

Upright Drilling Machines

These drill presses are similar to the sensitive drills except that they have power feeds and are built for heavier work. The upright column can be of the round or box type. The latter is more rigid so that it can handle heavier jobs.

The standard upright drill press is one of the more common types found in the shop and usually has a wide range of spindle feeds and speeds. Power can be supplied by belt and pulley but, in most of the newer machines, self-contained motors are used as the drive. Tables for these machines can be either round or square and can be moved up or down on the column, which is also true of the drill head. Both the head and table can also be rotated about the column. Thus, this type of drill press can be adapted for a wide range of workpieces. Where the workpiece is too large for the table, it can be swung out of the way and the work located on the base of the machine if the base is fitted with T-slots. The weight of the head is balanced by a counterweight suspended inside the vertical column. The machine shown in *Fig.* 3 is a 21-inch sliding head drill press for floor mounting. It incorporates three methods of feed: (1) sensitive rapid traverse hand feed with levers; (2) sensitive hand feed with wheel; (3) power feed.

When using the power feed mechanism, the operator selects the desired feed and speed by turning a direct-reading dial to the correct positions. The machine will then drill to a preset depth as determined by the depth gage, and then the power feed release trigger will stop the drill. It is then withdrawn manually.

The drill incorporates 16 spindle speeds which are obtainable by tilting the motor and motor bracket with the motor bracket tilting lever and placing the V-belt on the correct steps of the two pulleys. These speeds range from 76 to 2025 rpm.

The heavy-duty upright drilling machine in *Fig.* 4 is arranged with a thread leading feed attachment, special indexing fixture, and an auxiliary head with torque and guide bars with resetting brackets and resetting mechanism collapsing taps for tapping steel fittings.

Radial Drilling Machines

These drills are designed to handle large and heavy workpieces. The drill head is mounted on a radial arm which swings about the vertical column. This is the plain type listed above. The semiuniversal radial drill is equipped with a head which can

Fig. 3. This 21-inch Cincinnati upright round column single-spindle drill has a sliding head. Power feed is incorporated in this type.

be swiveled on the arm to drill holes in a vertical plane. When there is an additional swiveling adjustment on either the head or the arm so that holes can be drilled at any angle, the machine is called a universal radial drill. Radial drill dimensions are given in terms of the radius of the largest circle at the center of which a hole can be drilled. The other dimension usually given is the diameter of the column.

Radial drills range in size from small lightweight machines with three-foot arms to the giants which have arms more than 12 feet in length. The variety of work which can be handled on these machines depends somewhat on the attention given to selecting accessories, such as mountings, bases, tables and the locations where they are mounted. They can be mounted on wheels for transfer to the work when the piece is too heavy or too awkward to handle. Or the machine may be mounted on a track so that the workpiece may be put in position and the machine then moved into place for the required operation. Still another possibility is providing a pit alongside the machine with cover plates. When the workpiece will not fit the table, it can be positioned in the pit for drilling.

The radial drill shown in *Fig.* 5 is one of the smaller models. It has a three-foot arm and a nine-inch column. There are nine spindle speeds in geometrical progression with a 30-1 overall ratio, six spindle power feeds. The spindle speeds range from 80 to 2420 rpm and the spindle feeds from 0.0025 to 0.020 inches. Sensitive hand feed is available, and the machine is provided with a depth stop. The head is positioned on the arm by a rapid-traverse handwheel, while the arm is raised and lowered by a power mechanism.

Shown in *Fig.* 6 is a British radial drill which has a 4 to 6 ft radius and a 14-in. column. Its capacity is three inches in mild steel. A safety feature on this machine is a special nut which will prevent the arm from falling in case the elevating nut fails because of wear. Four ranges of spindle speed are provided and four feeds from 0.007 to 0.029 inches. The safety nut mentioned here is only one of several devices which can be incorporated in radial drills to prevent serious damage should an elevating nut fail. On one machine which uses a hydraulic drive, a control has been designed and installed which automatically locks the arm in position on the column should there be a failure.

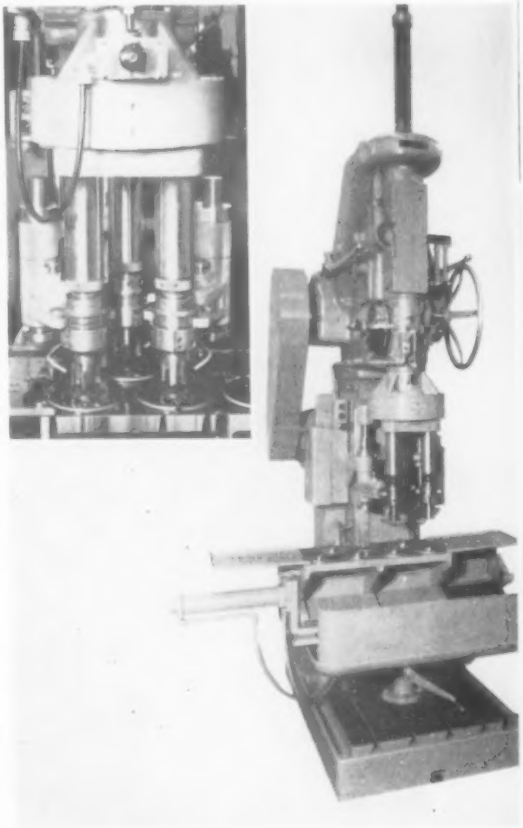
Flexibility on fixture work is one of the advantages of the radial drill as illustrated in *Fig.* 7. Positioning the drill head is obviously easier than shifting the workpiece for each hole.

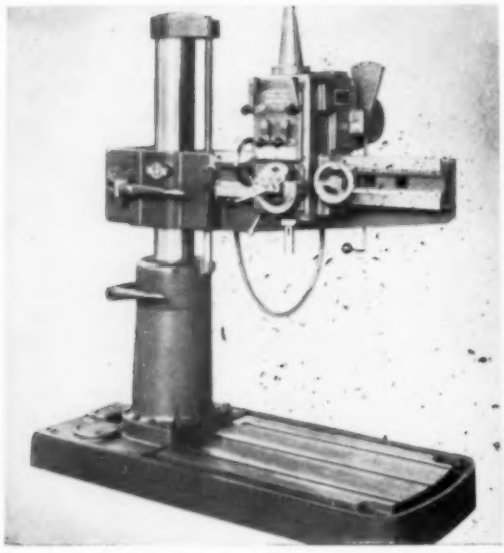
Fig. 4. This heavy-duty upright drill press, made by Barnes Drill Co., is set up for tapping steel fittings with a thread leading feed attachment, special indexing fixture and an auxiliary head with torque and guide bars with resetting brackets and resetting mechanism collapsing taps.

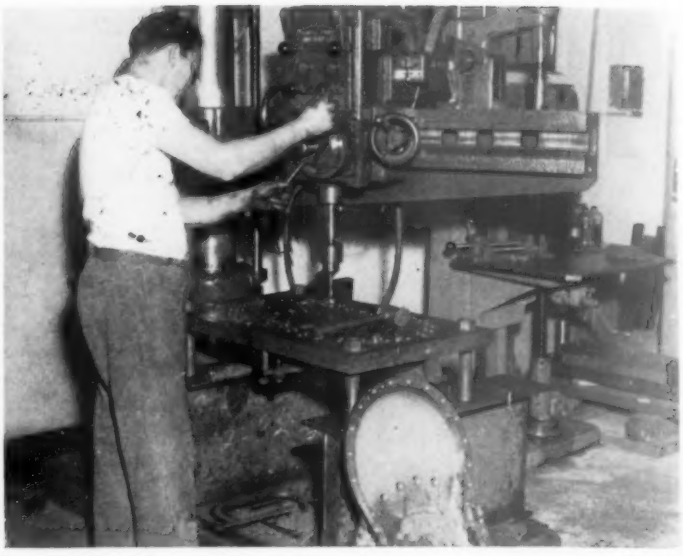
Gang Drilling Machines

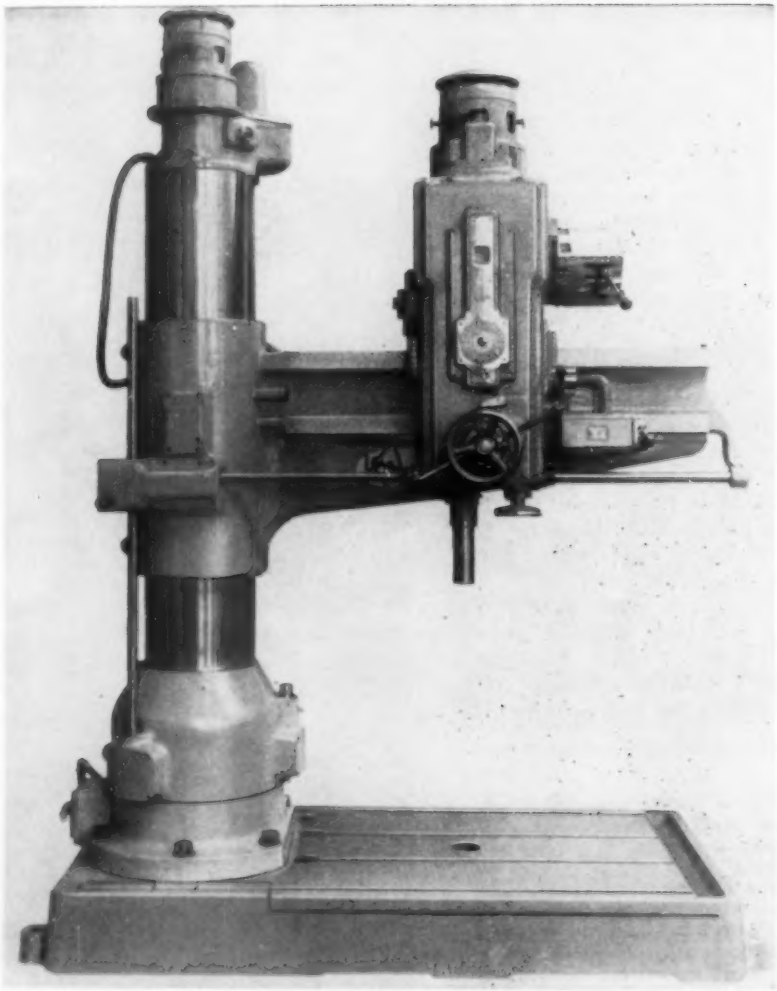
When two or more drilling spindles are mounted on the same table, the equipment is known as a gang drilling machine. This kind of setup is usually found where there is high production. One operator can easily run the drill and is in effect operating as many machines as there are spindles. The gang drill can be of two different kinds. In the first, the spindles are fixed at definite intervals along the table and in the other, they may be moved from time to time as production demands require.

When the quantities to be produced are large enough, special tooling can be provided so that one or more operations can be performed either simultaneously or in sequence. For instance, on a four-spindle drill, the first two spindles may bet set up to drill two holes while the second two spindles will









ream the holes. Or the gang drill is easily adaptable for drilling multiple holes in line. The workpiece for these operations is usually held in a jig which is easily moved along the table. A gang drill with seven drill heads mounted on the same table is shown in *Fig.* 8. This machine is designed for a production line for multiple hole drilling.

A variation on the gang drill press is shown in *Fig.* 9. Here the spindles are mounted radially in a turret on a circular carrier which revolves about the central column. They are all driven by one motor. Each spindle has a hand feed, adjustable depth stop and spindle return spring. A central V-groove pulley drives each spindle independently. By using adjacent spindles as intermediate countershafts, 24 spindle speeds, ranging from 28 to 1500 to 3000 rpm, can be obtained. The spindles accept drills up to 25/32 inch in diameter, have a 5-inch

Fig. 5. Top left is a 3-ft Cincinnati drill; has a 7-inch column.

Fig. 6. Radial drills, bottom left, are made in sizes up to 12 ft to handle large workpieces.

Fig. 7. Top right. The flexibility of radial drills on fixture work can be seen here. Holes are drilled, counterbored and tapped in rapid sequence without moving the casting.

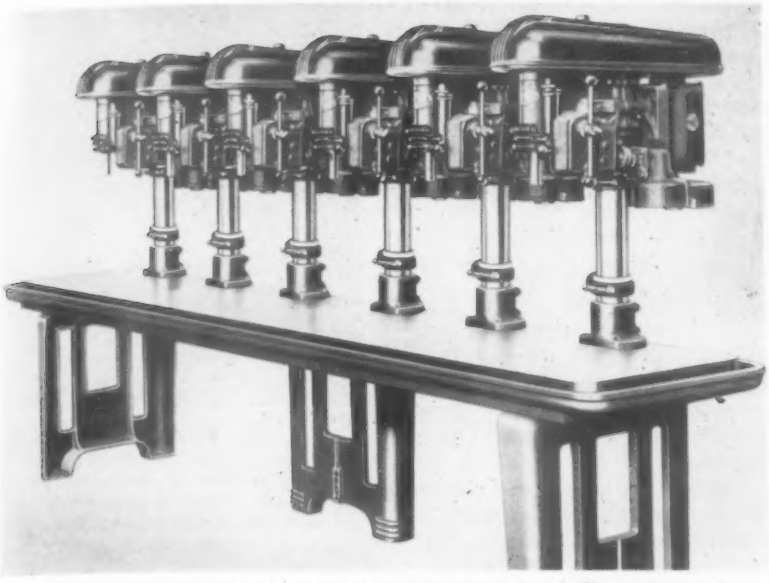


Fig. 8. Gang drill presses consist of two or more drill units mounted on a single table. This permits one operator to run a number of machines at the same time.

maximum travel and vertical adjustment of 6 inches. The spindles can be equipped with multi-spindle heads or tapping attachments. The spindles are indexed by a mechanism so that the workpiece need not be moved.

Another important advantage of the gang drill press is precision. There is a demand at present for more and more precision high-speed drilling of small holes such as are produced by the machine shown in *Fig.* 10. Here two sensitive drills are mounted on one table. Their capacities range from 0.004 to 5/16-inch hole diameter, with up to 8 inches of clearance from the center of the chuck to the column. Adjustable stops are provided on each spindle for individual control of hole depth, and spindle speeds, variable from 840 to 9300 rpm, are controlled by a graduated dial.

Perhaps the multiple head drilling machine shown in *Fig.* 11 cannot be called a gang drill press. But neither does it fit any of the other categories. It is a giant machine used to drill holes in the slope sheet of a tank hull. Notice that the heads are mounted on rails and that the work is positioned on the floor alongside of them.

Multiple Spindle Drilling Machines

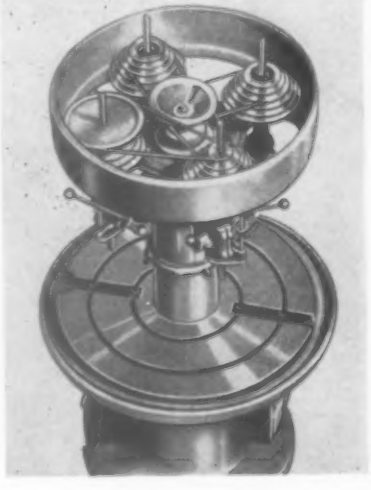
This category includes machines with a single head, or with multiple heads at various angles. The latter type are known as way drilling machines. The single head type has an upper spindle which in turn drives any practical number of spindles. This type of machine is used to drill a number of holes simultaneously in a workpiece, which it does with the utmost precision. Production must necessarily be large and repetitive to justify the cost of tooling such as this, since the cost of modifying the pattern, once set, is very high. This kind of operation usually requires a positioning device of some kind so that there will not be any variation from piece to piece. The auxiliary head shown in *Fig.* 12 has 16 spindles and drills a series of cylinder pad stud holes in the crankcase for a radial aircraft engine. The special indexing fixture is employed to hold the crankcase in position.

In other machines of this type, the position of the drills in the auxiliary head can be changed easily by merely unclamping and relocating to meet the new specifications. Another variation is that, instead of moving the heavy drill head to the work, the table is raised, bringing the work to the drills. This may be done by a rack and pinion drive, by lead screw, or by a rotating plate cam. The last method gives quick approach, uniform speed and quick withdrawal to the starting position.

The machine in *Fig.* 13 is hydraulically operated and can be set up for drilling, reaming, and tapping with multiple spindle heads, each holding from 2 to 40 spindles. The indexing table has built-in self-centering three-jaw chucks, or, as an alternative, two-jaw self-centering chucks mounted on top and hydraulically operated so that they will automatically close before going through the first operation. The drilling side of the machine is driven by a 5-hp motor while the tapping side has a three-hp motor drive through a 3-step V-belt cone pulley arrangement. Pickoff gears provide speeds in 12 steps from 240 to 1328 rpm. It is not necessary to depend upon reversal of the motor for the tapping operation which is accomplished through a tapered cone clutch.

A multiple-spindle machine with three stations for various operations on a cylinder upper crankcase is shown in *Fig.* 14. The machine drills, spotfaces and taps 11 jet

Fig. 9. Four individual drill units are mounted on a revolving turret. One power supply drives all four units.



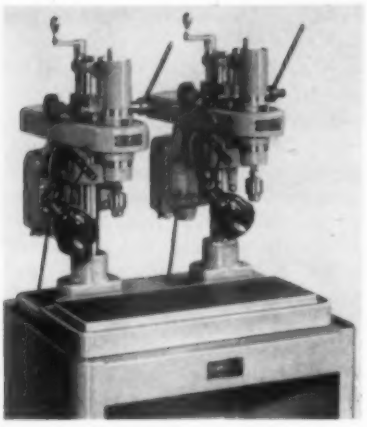


Fig. 10. Small precision drill presses made by the Hamilton Tool Co., are ganged to turn out precision holes at high speed.

holes; drills 7 oil holes from the crank bore into the oil gallery and mills 7 main bearing insert lock grooves. The machine consists of three angular columns with VS slide type drilling units at stations 1 and 2, each with an 18-spindle drilling head; there is another VS slide type unit at station 3 with an 11-spindle lead screw tapping head and a 7-cutter milling unit. Three individual fixtures are arranged with rollers so that the crankcase can be moved by hand from station to station. In each fixture, the part is moved to a rough stop and then lowered over locating plugs in each end of the cylinder bore and against adjacent head face.

The sequence of operations follows:

Station 1—

Drill (1) 0.339-in. hole
Combination drill (10) 7/16-in. and $\frac{3}{8}$-in. diameter holes
Drill (7) 0.339-in. holes

Station 2—

Spotface (11) $\frac{5}{8}$-in. holes
Drill (7) 0.339-in. holes

Station 3—

Tap (10) $\frac{1}{4}$-in. pipe tap holes
Tap (1) $\frac{1}{8}$-in. pipe tap hole
Mill (7) bearing notches

The tapping head and the milling unit are carried on a hydraulic feed slide unit that provides the feed for the milling cutters. As the milling cutters are being fed into the work, the work taps are fed in, reversed and backed out by individual lead screw spindles. Production is approximately 17 parts per hour at 100 percent efficiency.

This machine is built for a special purpose where production is large enough to justify the expense. When variations can be worked into this type of equipment, tooling costs can be cut since they can be used for several different workpieces. This is true of the five-way drilling and tapping machine in *Fig.* 15. It is designed to produce jet engine housings, but, since two of the five heads can be interchanged, several types of housings with an assortment of bolt-circle specifications on faces with identical radial locations can be produced. Since production is relatively low, loading, clamping and indexing of the housings in the fixture is manual.

In operation, the aluminum alloy jet engine housings are loaded in the fixture where they are located by an OD ring and a pin in a bolt hole. The fixture is rotated clockwise by hand to positions where individual hold-down clamps can be tightened. After clamping, the fixture is brought to the starting position and the index lever is operated to lock the fixture in place. When the index lever is operated, three air-operated hold-down clamps are also applied on the index table. By

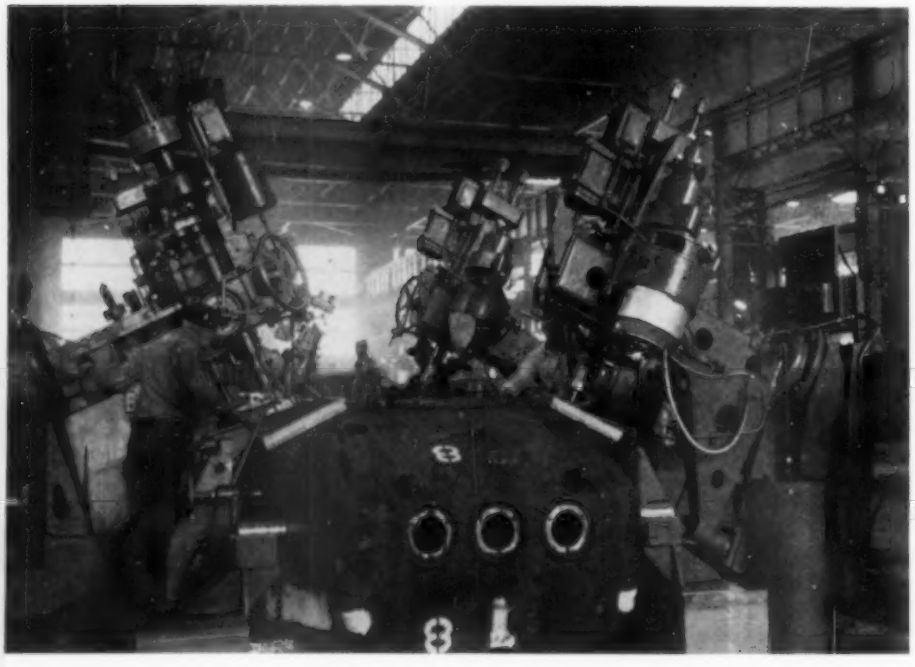


Fig. 11. Slope sheets on a tank hull are drilled for suspension bracket bolt holes by a multiple-head drilling machine.

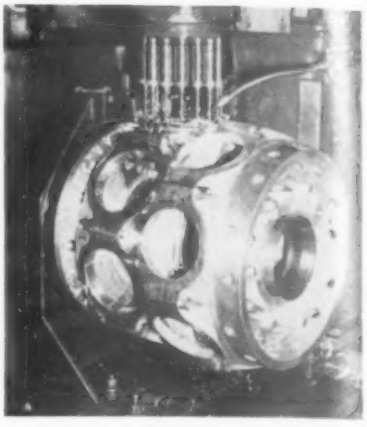


Fig. 12. This auxiliary head mounts 16 spindles. A special indexing fixture is employed for drilling a series of cylinder pad stud holes in the crankcase.

ushing the reset button, a counter nd circuit for predetermined auto- atic selection of head combina- ions are then set.

Indexing between operations is lone manually by rotating the table fter the index pin and clamping ylinders have been automatically released by the return stroke of the heads. The table is designed so that it can be indexed in a clockwise direction only and cannot be indexed past successive stations. The index pin is again pushed into operating position after indexing and the table clamps energized. The cycle start button is next operated and the correct heads begin to feed. Eight stations and nine operations complete the multiple drilling and multiple tapping of the holes in the housing.

The machine in Fig. 15 is a way-type semiautomatic drill. Most of these machines are used in the automotive and aircraft industries where the myriad of holes to be drilled in precisely the same location in each workpiece require the application of special tooling.

Automatic-transfer Processing Machines

These machines are in reality production lines in that the work is placed in the machine at one end, transferred automatically from one station to the next as each series of operations is completed, and emerges at the other end. They are usually made up of a series of machines such as those shown in *Figs.* 14 and 15 with provisions for handling between them. The transfer machine may seem a long way from the simple drill press, but the principle is still the same. It is in these machines that tool engineering has applied the principles of automation.

The transfer unit shown in *Fig.* 16 is part of a new high-production line for processing V-type automotive cylinder blocks, has 18 stations and performs 110 machining operations in 38.3 seconds. Drilling, reaming, boring, counter-boring, and core-drilling operations are performed in machining the banks, sides, and starter-mounting pads of the blocks. Production is 75 blocks.

The cylinder blocks are received from a preceding machine with the pan-rail up. Upon entering the 74-ft unit, a turnover fixture at the first station raises the block, rotates it 180 degrees, and deposits it pan-rail down, in which position it remains throughout the machining operations performed by the unit. Another turnover fixture in the seventh station raises the workpiece and rotates it 360 degrees to remove the chips accumulated inside the block.

The left-hand heads at stations 11, 12, 14 and 15 are cross-feeding units that drill and bore the starter-mounting holes parallel to the axis of the block. They accomplish this by advancing to position, cross-feeding the tools to complete the drilling and boring operations, and then retracting the tools from the holes and withdrawing clear of the

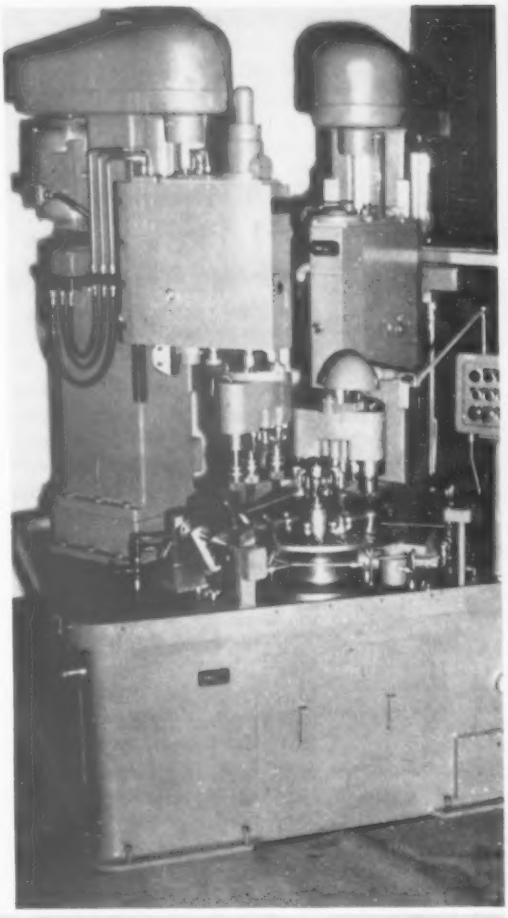


Fig. 13. (above) Either drilling or tapping can be performed by the multiple spindle heads on this hydraulically driven machine. Each head mounts from 2 to 40 spindles.

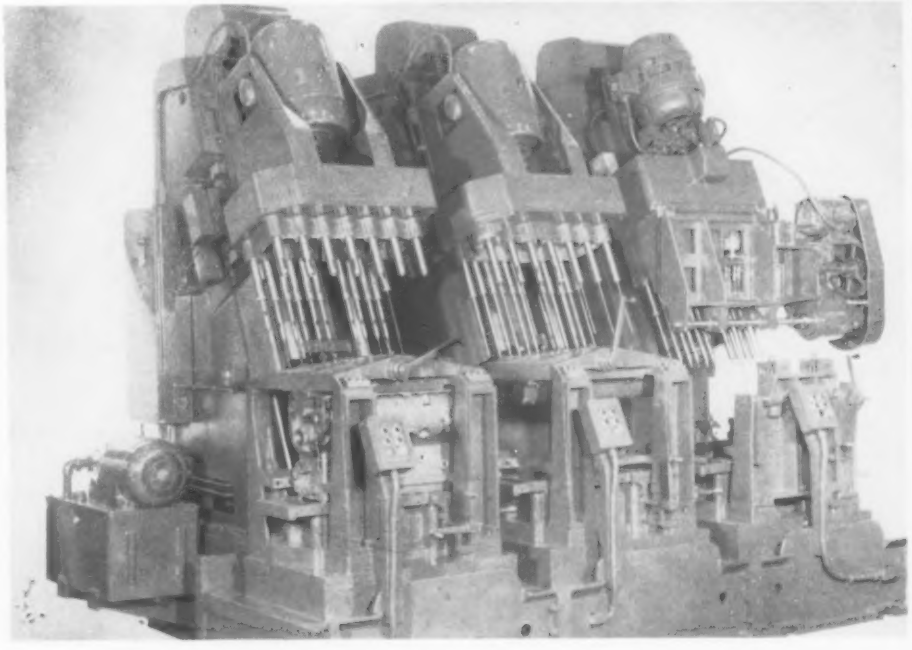


Fig. 14. (below) Seventeen cylinder upper crankcases per hour are produced on this special purpose three-station machine which performs drilling, spot-facing, tapping and milling operations.

workpiece to allow it to transfer to the next station.

Four of the stations are idle, providing for inspection purposes and for removal of the workpiece when necessary. Each working station can be reached from either side of the head for changing and setting the tools.

Deep-hole Drilling Machines

A deep hole is considered to be one which is more than five times the diameter of the drill, and the production of this type of hole calls for special skills, knowledge and machines. Both vertical and horizontal types of machines have been developed for deep-hole drilling and in both cases there may be a further variation in that either the work or the tool may be held stationary. The biggest problems are to hold the work rigid, which becomes more difficult as the depth of the hole increases, and to remove the chips from the bottom of the hole. Deep-hole drilling machines employ supports for rigidity in the workpiece, while the drills used usually have only one cutting edge and a single flute. Cutting fluid is forced into the hole through an oil hole in the drill, under pressure. When the cutting fluid returns by way of the flute in the drill, the chips are carried along. Extreme care is necessary in computing feeds and speeds for this operation.

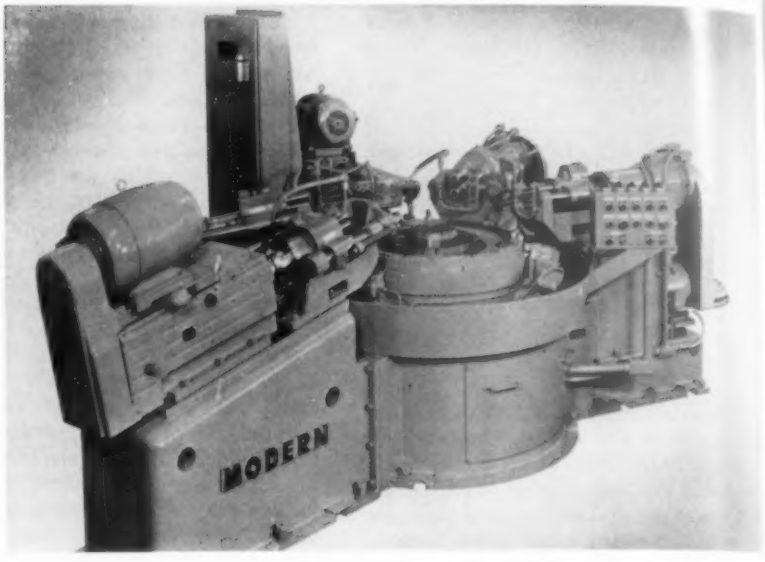
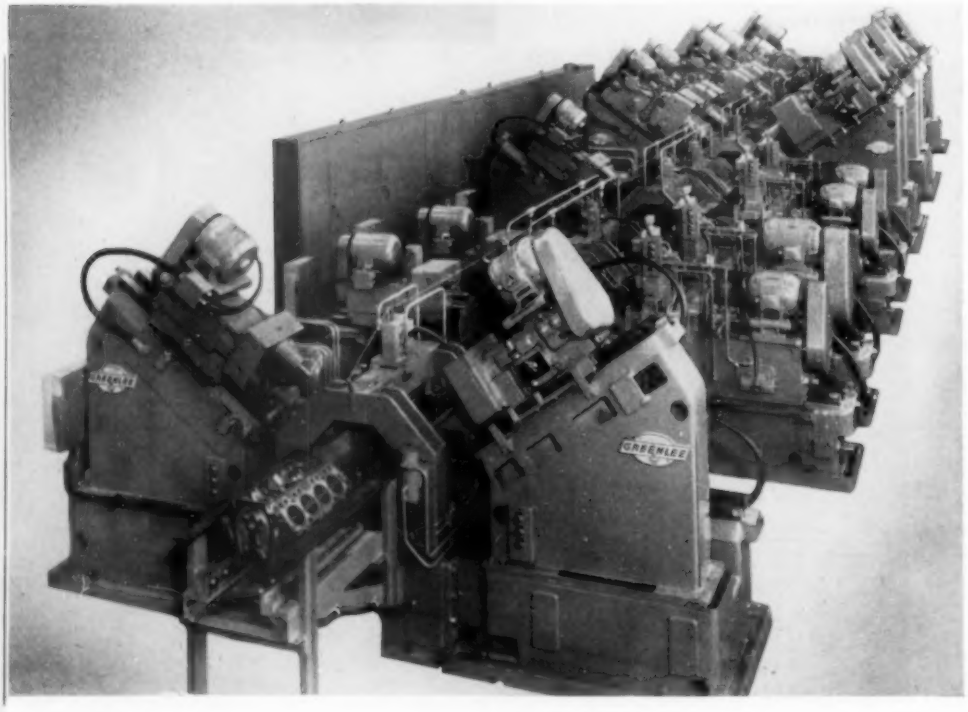


Fig. 15. (above) Interchangeable heads on this drilling machine permit production of a variety of jet engine housings. Indexing is manual since production is relatively low.

Fig. 16. (below) At the other extreme from the portable drill is this 74-ft transfer machine which performs 110 machining operations on a cylinder block in 38.3 seconds.



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Cover

Cincinnati Lathe and Tool Co.

Another Tool Engineering Report will appear in January issue, *The Tool Engineer*.

Tool Engineering Foundation Trustees Elected at Semi-Annual Board Meeting

Vote to Award Ten $750 National Scholarships; Area Meeting Program Draws 300 ASTE Members

By Nancy L. Morgan

Marking one of the most significant milestones in the twenty-year history of ASTE, a national Tool Engineering Research Foundation to carry out scientific research projects in the fields of manufacturing, manufacturing processes, and allied tool engineering subjects was assured with the election of the first five trustees of the foundation by the Society board of directors at the 20th semi-annual meeting held October 10-11 at Buffalo's Statler Hotel.

Elected as trustees were: Roger E. Gay, president of the Bristol Brass Co. of Bristol, Conn., and also president of the American Standards Assoc.; David A. Wallace, president of the Chrysler Div., Chrysler Corp., Detroit; Robert B. Douglas, president of Godscroft Industries and Specialloid, Ltd., of Montreal, Que., and a past national president of ASTE; John Slezak, president of the Turner Brass Co., Sycamore, Ill.; and Louis F. Polk, president of the Sheffield Corp. of Dayton, Ohio. Douglas will serve as chairman pro tem.

First act of the trustees will be to charter the Foundation as an independent and non-profit scientific research organization at a meeting to be held at ASTE national headquarters in Detroit on October 26.

Tentative plans call for making use of industrial laboratories, colleges and universities throughout the nation for carrying out of research projects. As an initial contribution to assist in the establishment of the much needed foundation, $75,000 has been appropriated by the Society itself.

Additional trustees of the foundation will be elected by the ASTE board of directors until a total of 15 is reached. The trustees will have no specific tenure of office. The chairman of the board of trustees of the research foundation will be elected by Society board members at a later date.

National President L. B. Bellamy said, "Need for such a foundation was recognized several years ago and has been confirmed by a series of meetings with industrial, research and other leaders over the past two years.

"Since our leadership in production know-how is our most effective weapon to defeat Communism," he said, "it is essential that every effort must be made to maintain or even increase America's advantage in this vital field."

Mr. Bellamy said that ASTE has undertaken this project as a civic responsibility. With a membership of more than 23,000 production experts in the United States and Canada, it is the largest organization in history devoted to the problems of manufacturing methods and equipment, the tools of industry.

Four new members of the ASTE's board of Directors were sworn into office at the Society's 20th semi-annual meeting in Buffalo. President L. B. Bellamy (standing, far left) administered the oath of office to (standing, from left): Roger F. Waindle, first vice president; Willis G. Ehrhardt; Fred J. Schmitt and Gerald A. Rogers, assistant secretary-treasurer of the Society. The ceremony took place just before the board began work on its tremendous agenda. Others pictured (from left) are: Allan Ray Putnam, assistant executive secretary; George A. Goodwin; W. B. McClellan; Harry E. Conrad, executive secretary; Dr. Harry B. Osborn, Jr., third vice president; H. E. Collins, secretary; Thomas J. Donovan, Jr.; and Ben J. Hazewinkel.

James Y. Scott, president of the Van Norman Co., Springfield, Mass., holds the conversational spotlight at an informal gathering before the membership banquet. With him are: W. J. Reich, host chairman for the area meeting; William Clarke, general chairman; President L. B. Bellamy and Executive Secretary H. E. Conrad.

It may be business conditions in Buffalo that five members of the ASTE board of directors are discussing with V. T. Gorguze (third from right), general manager of the Curtis Wright Corp., Buffalo. Shown with him, from left, are: W. B. McClellan, Willis G. Ehrhardt, F. J. Schmitt, R. F. Waindle and G. A. Goodwin.

Resulting from another vital decision made by the Society's board of directors at the Buffalo meeting, ASTE's national scholarships which were established just two years ago will be ten in number and valued at $750 each beginning in 1953-54. Nine of the awards will be made to students attending schools and colleges in the United States and one will go to a Canadian university student.

The scholarships are an important part of the ASTE program to expand vocational education facilities and to encourage students to study tool engineering. Presently, five such awards are made annually and are valued at about $300.

Board members also voted to present a gift of $1,000 to the Detroit Exposition being planned to help expand convention facilities in the Motor City.

> Dayton, Ohio, will be the location of the 21st semi-annual board of directors and membership meeting to be held in October of 1953.

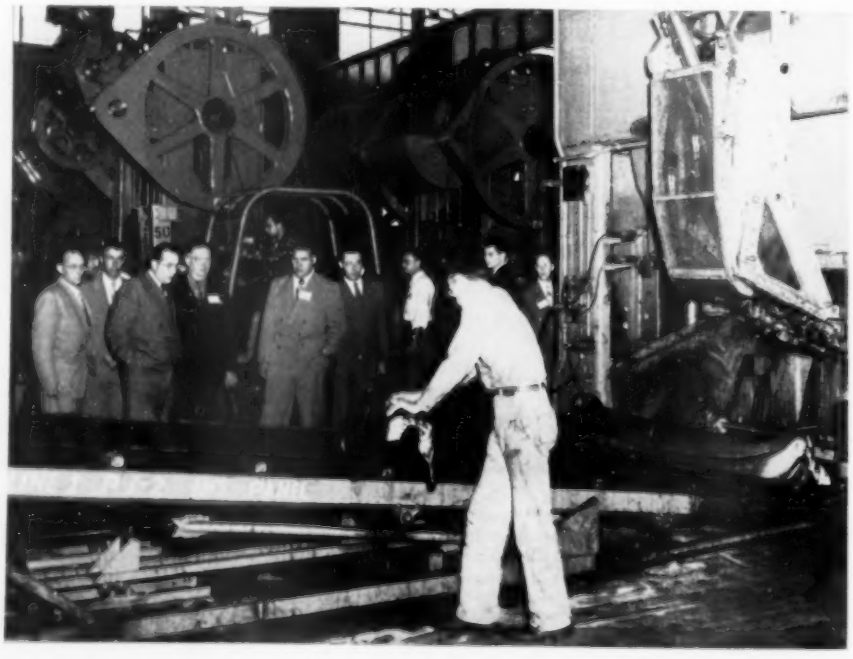
Other program activities at the International Area meeting drew a registered attendance of nearly 300 members from Buffalo, Rochester, Syracuse, Elmira, Toronto, Hamilton District, Erie, Niagara District, Mohawk Valley, Grand River Valley, London-St. Thomas, and Peterboro ASTE chapters.

The two-day schedule of plant tours, technical sessions and ladies' activities was highlighted by the membership banquet held Friday evening. More than 300 persons attended the dinner program held in the main ballroom of the Statler Hotel.

Principal speaker was James Y. Scott, president of the Van Norman Co., Springfield, Mass. Mr. Scott presented an informal address on business and life in America, pointing out the great opportunities available to tool engineers for outstanding leadership.

"Only by a return to a solid religious foundation," he said, "can we preserve our greatest heritage, our individual freedom. We cannot get something for nothing. What we create, we get back in return. And this applies in production just as it does in the field of human relations. If we produce more, at low enough cost, we'll sell more and help to insure the prosperity and future of our country."

In his welcoming address, Robert B. Douglas, past national president of the Society from Montreal, Que., said that Buffalo, having been a crossroads for westward surge and a historical symbol of common possession, was a most appropriate location for an International Area Meeting. Both Canada and the United States reap benefits from the cooperative engineering feats at Niagara Falls.



One of the most outstanding features of the area meeting was the tour taken by ASTE members of the new Ford Stamping plant in Buffalo. Line one, pictured here in part, served as a major point of interest for the visitors who watched the huge presses turn out instrument panels for Ford automobiles.

After a full day of meetings and serious discussion of official matters, national ASTE representatives enjoy a few minutes of relaxation. Pictured here are: H. E. Collins, secretary; Jay N. Edmondson, head of the temporary committee for ASTE tool engineering research fund; and L. F. Hawes, public relations chairman.

Also discussing matters of a lighter vein are: Ben J. Hazewinkel, board member; Wayne Kay, head of the national editorial committee; R. C. W. Peterson, chairman of the standards committee; Arthur R. Diamond, education chairman; Dr. H. B. Osborn, Jr., third vice president and A. B. Clarke, membership chairman.

Pleading for a more free exchange of technical information and ideas, Mr. Douglas said, "Truly, both nations stand as stewards of Western culture. People living in a free world are not only outnumbered, we're being outmaneuvered and out-produced. We must solve these problems and one very important solution is greater productivity. We cannot retreat behind a curtain of technical isolation, but must continue to increase a free exchange of ideas between Canada and the United States."

President L. B. Bellamy, speaking on "The Challenge for Survival," stressed the importance of engineers and engineering to the future of the world. He discusses the important roles of leadership which tool engineers must fill if life as we know it today is to survive.

Meeting with Wayne Kay, chairman of the national editorial committee, chairmen of other national ASTE committees discussed policies of THE TOOL ENGINEER and news coverage of committee activities.

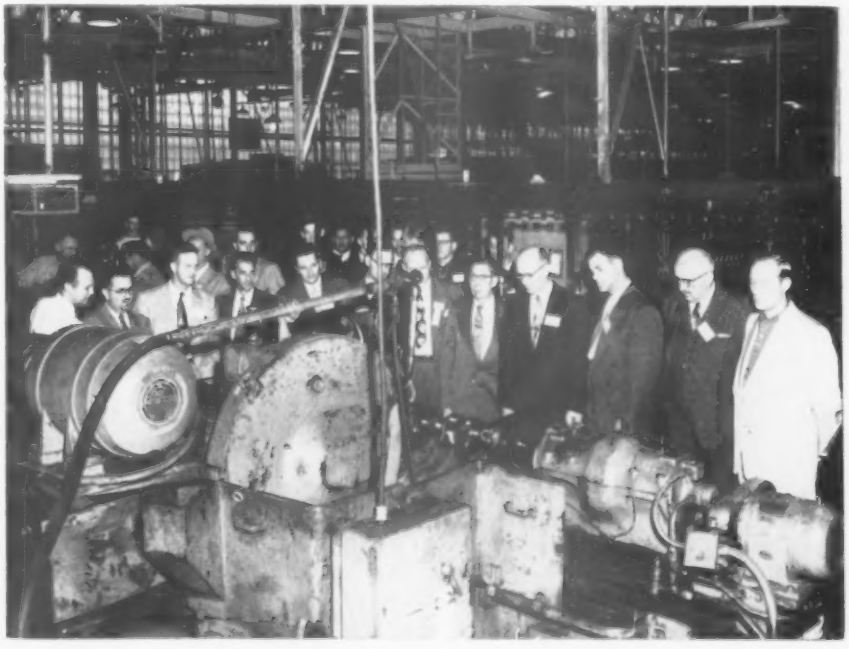
Members of the national book committee took a specially conducted tour of the Ford Stamping plant and also held a general work session to review material for the *Die Manual*. The public relations committee discussed a check sheet to be distributed to chapters to aid in publicity coverage of chapter news. Additional work on revising the procedures manual was the objective at a meeting of the constitution and by-laws committee. Men serving on the membership committee reviewed prospective chapter possibilities and discussed potential chapter areas.

Highly successful tours provided opportunities for more than 200 members to study operations at the Worthington Corp., Ford Stamping plant and Chevrolet's engine plant.

Technical sessions also had good attendance. A total of 300 persons heard lectures delivered on "Utilizing Machine Press Capacity Through Dial Feeds," "Electro-Mechanical Machining of Hard Metals," "Tool Stores and Maintenance," and "Hi-Jet Lubrication."

Program speakers were W. W. Schug, general sales manager, The V & O Press Co.; M. F. Judkins, chief engineer, High Temperature Alloys Div., Firth Sterling Steel and Carbide Co.; Terence F. Dundon, tool supervisor, The Carrier Corp.; and B. R. Walsh, head, Industrial Engineering section, Gulf Research & Development Co.

ASTE ladies' activities at the area meeting attracted a registration of 40 persons. Their two-day program included participation on the radio show "Breakfast at the Lenox," a fashion show and luncheon at Oppenheim Collins, a tour of the Ontario Hydro plant and a visit to Niagara Falls.



Another plant tour feature at the Buffalo meeting was the visit made by more than 60 ASTE members at Chevrolet's Tonawanda Engine plant. Here, a group of Society delegates studies Chevrolet methods of machining crankshafts. Also included on the tour schedule was a visit at the Worthington Corp. plant.

ASTE Officers Meeting Held in Greensboro, N. C.

What probably was the most heavily attended session of any technical society in the Carolinas was held September 26 when the Piedmont chapter staged its first annual Executives' Night at the Starmount Country Club in Greensboro, N.C.

With the national officers of the Society on hand for their semi-annual meeting that weekend, the program drew a record crowd of 168 members and guests, including executives of many of the state's large corporations.

Theme for the evening's program centered about the need for more and better vocational education in North Carolina. The keynote was sounded first by Piedmont Chairman C. J. Rix, who acted as toastmaster, and was amplified in speeches delivered by S. C. Donnelly, superintendent of the Western Electric plant in Burlington, N. C.; Brandon P. Hodges, treasurer of the state of North Carolina; and Society President L. B. Bellamy.

Stressing the importance of ASTE to industrial development, Mr. Bellamy urged all Society members to join in the effort to expand vocational education in this country. He said this was doubly important in light of the fact that we are lagging far behind Russia in the education of all types of engineers.

Mr. Hodges spoke on the tremendous industrial development in the state and said that North Carolina in the last 50 years has enjoyed an annual dollar volume from 85 million to six billion dollars. This growth, he said, has occurred for the most part in the textile, furniture and tobacco industries. Similar development in the metal trades will depend largely on the state's ability to furnish trained personnel to attract such industry.

Mr. Hodges said, "While North Carolina's natural resources are considerable, full use of that potential depends on the improvement of state facilities for vocational and professional education, particularly in those fields which train personnel for today's mass production manufacturing operations."

In his talk, Mr. Donnelly discussed Western Electric's expansion in North Carolina which presently includes three major manufacturing operations. He, too, pointed out the need for trained engineering personnel.

This meeting capped a full schedule of tours of local manufacturing establishments and tobacco markets by the national officers and paved the way for Saturday's business session at Sedgefield Inn in Greensboro.

The ASTE budget was the chief concern of the national finance committee at its Detroit meeting. From left, seated: Milburn Ross, Treasurer H. C. McMillen, President L. B. Bellamy, Chairman W. F. Jarvis. Standing: Daniel Wesson and H. Dale Long.

ASTE Chapter Sponsors Pressworking Classes

Special evening courses dealing with the pressworking of metals are being offered engineers, technicians and draftsmen from Canadian industry at the Montreal Technical School under the sponsorship of the education committee of Montreal Chapter of ASTE.

Included in the courses, which will offer basic knowledge of press tools that would require years of industrial experience, are such subjects as: types of punch presses, die design, auxiliary press equipment, press maintenance, stamping materials and safety measures.

Cincinnati Honors Prospective Members

Cincinnati—Membership Night held September 9 at the Engineering Society of Cincinnati launched fall activities for more than 200 members and prospective members of the ASTE chapter. A buffet dinner and a technicolor movie on hunting in Alaska were featured on the evening's program. Robert Shumway, membership chairman, introduced 14 new members to the chapter.

A technical lecture on "Milling Cutters—Design, Application and Maintenance" was presented by Lewis H. Goddard, vice president in charge of engineering, Goddard & Goddard Co.

Dealing with the three most common types of cutter materials, high-speed steel, cast alloys, and carbides, Mr. Goddard explained that one of the best methods of comparing the efficiency of a certain cutter material is by the square inches milled per tooth per grind. Citing statistical reports, he said that high-speed steel is still the most economical for certain classes for milling.

National Officers Meet With Canadian Delegates

A number of top national officials of the Society met with representatives of eight Canadian chapters in Galt, Ont., September 20 to discuss ASTE plans and programs for the coming year. Delegates from the Hamilton District, London-St. Thomas, Montreal, Niagara District, Peterboro, Toronto and Windsor were on hand for the conference at the Iroquois Hotel.

Other participants included L. B. Bellamy, national president; G. A. Rogers, assistant secretary-treasurer; A. B. Clark, chairman of the national membership committee; Harry Whitehall, area membership captain; Grant S. Wilcox, Jr., member of the national standards committee; H. E. Conrad, executive secretary, and C. T. Burke, secretary of the national standards committee.

Chairman at the conference was David McCready, head of the Grand River Valley chapter, who conducted the all-day session. The meeting was opened at 10 a.m. and continued, with a break for luncheon, until the dinner hour.

Bellamy Postpones Chapter Visitations

Because of previously unforeseen business commitments, Society President L. B. Bellamy has been forced to cancel his trip to the west coast to visit California's seven ASTE chapters. In letters notifying chairmen of those chapters of his change in plans, Mr. Bellamy expressed his regret that such a decision had to be made and said he hopes arrangements can be made to take the trip the early part of next year.

New Members Added to Golden Gate Roster

Oakland, Calif.—Twelve new members were introduced to the Golden Gate chapter at the group's September 17 meeting. A change in officers took place when Raymond Reed was named treasurer of the chapter to replace Kerian Shomber who resigned his position because of pressing business commitments.

The technical portion of the program was provided by Harry Conn, chief engineer, Scully-Jones and Co. He delivered an illustrated talk on production tooling problems, stressing tapping problems and their solutions.

Sales Manager Reviews Developments in Turning

Galt, Ont.—A technical session on "The Latest Developments in the Turning Field" was presented by Sailor Beer, sales manager, Monarch Machine Tool Co., Sydney, O., at the opening meeting of the Grand River Valley chapter held September 5 at Moffat Banquet Hall.

After introducing his program with a resume of historical material on the development equipment for engine lathes, Mr. Beer narrated a film which showed the complexity of contours which are formed in a single pass of the tool and the reduction in floor-to-floor time of pieces turned using tracermatic equipment.

Richard Bacik, secretary of the ASTE national program committee, was a guest at the meeting and told of the arrangements made for the International Area Meeting. The program was followed by a buffet luncheon.

Pittsburgh Chapter Holds Annual Outing

Pittsburgh—Sept. 12 was the date of the annual golf outing of the Pittsburgh ASTE chapter. More than 200 members attended the 1952 party held at Churchill Valley Country Club.

Ray Sprigle, feature reporter with the *Pittsburgh Post Gazette*, gave a talk on rackets which have existed and do exist now in Pennsylvania. He stressed the fact that laymen should be greatly concerned about them because rackets cannot operate in any community without corruption in government.

Roger F. Waindle:

Society Vital for Industrial Progress

"The American Society of Tool Engineers is one of the most vital forces for industrial progress this country has ever seen," Roger F. Waindle, first vice president of the Society, told a group of South Bend, Ind., industrial leaders at a meeting sponsored October 2 by the executive committee of the South Bend ASTE chapter.

"The Society's value to industry has increased at a rapid rate since those few men founded ASTE back in 1932," Mr. Waindle said. "Even 20 years ago they recognized that the strength of America was not in its material wealth but in its capacity to produce. And they recognized that the best machines are just so much fabricated raw material without the men who know how and what to use where and when."

As ASTE grew in stature, industrial firms found that the participation of their own tool engineers in the activities of the Society made those tool engineers of greater value to their companies. Interchange of information and ideals at technical meetings helped broaden their knowledge and even improved their ability to express themselves, continued Mr. Waindle.

The annual and semi-annual meetings offer vital technical milestones in the furthering the techniques of production. The national shows which the Society has staged every two years except during World War II enable members to inspect in a brief space of a few days ideas in equipment and tooling which otherwise wolud require months of intensive effort. The expositions have become a service to all industry as evidenced by the registered attendance of close to 40,000 in Chicago in March of this year.

Mr. Waindle emphasized the services provided through THE TOOL ENGINEER magazine and the tremendous amount of technical information contained in the *Tool Engineers Handbook*, which stands today as the chief reference work on production methods and equipment not only in the U. S. but in most of the industrial countries of the world.

"In recent years ASTE has become quite an active member in the American Standards Assoc.," he said. "The data sheets and engineering sheets which the Society has published and distributed are important aids in everything from plant layout to detailed tooling on specific operations."

Describing the efforts of ASTE to encourage expansion of vocational educational facilities, Mr. Waindle told the industrial executives about the valuable scholarships offered by the Society and the many similar awards made by individual chapters.

He also explained another major objective of ASTE, better public evaluation of the importance of tooling and tool engineering.

"In providing these and many other services," he said, "ASTE is making a vital contribution not only to its members but to industry at large. It is now engaged in launching broad scale research in tool engineering through the Tool Engineering Research Foundation. Thousands of dollars have already been appropriated to establish this foundation.

It has but one objective, as do all activities of the Society—to serve ASTE members and to serve industry, and through that service to serve the nation.

Detroit chapter's carbide section held its September meeting at the Super Tool Co. Nearly 350 members and guests participated in a tour of the plant which lasted about two and one-half hours. Pictured is a group watching the grinding of a ten tooth cutter on an Ingersoll grinder.

McClellan Addresses Rocky Mountain Meeting

A Rocky Mountain Executive Conference was held September 27 in Denver, Colo., and drew attendance from ASTE chapters in Albuquerque, Los Alamos, Salt Lake City and Denver. Thirty chapter and committee chairmen met with National Director W. B. McClellan to discuss plans and policies of the Society.

The meeting, held at the plant of Shwayder Bros., convened at 3 p.m. Introductions were made by Warren Foss of the Denver chapter and minutes of the conference were taken by Frederick Preator, professor at Utah State Agricultural College and member of the national education committee.

After a talk made by Mr. McClellan, two discussion groups were formed to cover programming, membership, chapter finances, education, professional engineering and scholarships. Clinton J. Helton, member of the national program committee and first vice chairman of the Denver chapter, and Leslie C. Seager, member of the national professional engineering committee and the Salt Lake City chapter, served as moderators.

Test Pilot Speaks on Transonic Age of Flight

Montreal—ASTE members of the Montreal chapter learned about "The Transonic Age of Flight" at their September meeting held at Montreal Technical School. The program speaker was the chief test pilot for Canadair, Lt., Capt. A. J. Lilly.

Taking his ASTE audience on an imaginary flight in a Sabre Jet, Capt. Lilly described the preparations for the take-off and told of the sensations of flying at an altitude of seven to eight miles. He spoke at length on approaching and piercing the sonic barrier and the effects it has on the craft and

Jording Installed as Acting Chapter Chairman

Rock Island, Ill.—Gilbert H. Jording, formerly first vice chairman of the Tri-City chapter, was installed as acting chairman at the September meeting held at the Rock Island Arsenal. The group's former chairman, Lee Johnson, resigned his position because of his move to South Bend.

Technical speakers at the meeting were A. J. Zocalli, sales engineer, and Russell King, development engineer, Bay State Abrasive Co., Westboro, Mass. Their talks were accompanied by two sound films, one of which was a premier showing of a new movie titled "Wheels of Tomorrow." An informal discussion period concluded the session.

Cleveland Chairman A. B. Clark presents the first affiliate membership plaque to E. P. Simon, vice president of the Ohio Machine & Boiler Co., Cleveland.

"Method X" Discussed at Cleveland ASTE Meeting

Cleveland—"Method X" was the subject of the first fall technical session of the Cleveland ASTE chapter. Program speaker was M. F. Judkins, chief engineer Firth Sterling Steel & Carbide Corp., who presented a discussion of his firm's machine called "Method X." A demonstration showed how holes were bored in carbide within tolerances of 0.0002 by means of electricity and brass plugs which had previously been turned to the required size and shape hole.

About 125 members and guests attended the dinner meeting held September 12 at the Hotel Carter. The coffee talk was delivered by Leonard Voorhees, pupil personnel director of the Euclid Board of Education.

Dr. Osborn Addresses Columbus ASTE Chapter

Columbus—Technical speaker at the opening meeting of the new season was Dr. H. B. Osborn, Jr., technical director, Tocco Div., Ohio Crankshaft Co., and third vice president of ASTE. He spoke to nearly 50 members and their guests on the subject "Induction Heating."

The dinner meeting was held September 10 at the Columbus Maennechore. The coffee talk was presented by Bernie Hodapp, president of the Peerless Saw Co.

Bellamy Guest of Philadelphia Chapter

Philadelphia—ASTE members of the Philadelphia chapter inaugurated the new meeting session September 18 with executives and ladies night. President L. B. Bellamy was a guest of the chapter for the evening. Featured speakers were Victor C. Diem, radio executive, show spoke on " It's Fun to Live in America," and Navy Chaplain Capt. Francis Albert, who gave a coffee talk.

Toronto Members Tour Modern Tool Works, Ltd.

Toronto—Nearly 200 members of the ASTE chapter in Toronto participated in a tour of the Modern Tool Works, Ltd., held September 3. The visitation provided the opportunity for members to view some of the machining operations being performed on components for the various machines that the firm manufactures. Special machine tools designed and built by Modern, as well as some of the machines for which the firm is the sole agent, were displayed.

After the tour, Chairman Fred Lockhart extended the appreciation of the chapter to the company and its president, Ed Barker.

John Thomas Promoted

John H. Thomas, formerly manager of the Homewood manufacturing and repair plant of Westinghouse Electric Corp., Pittsburgh, has been appointed manager of manufacturing at the firm's East Springfield, Mass., plant. He is a member of the ASTE chapter in Pittsburgh.

An aerial view of the campus of the University of Illinois, where the Second Annual Tool Engineering Conference will be held in November, shows the Illini Union building in the foreground. A complete program is being scheduled for ladies' activities.

Plan November Meeting on Army Press Program

Dayton—In the first public discussion of the Air Materiel Command's heavy forging press program, Col. Wilbur E. Carter, chief of the Industrial Service Branch, Production Resource Div., Wright Field; E. A. Irwin, vice president, E. W. Bliss Co., Canton, O.; and R. F. Moore, plant manager, Newark Heavy Forging Press Plant, Kaiser Aluminum Co., Newark, Ohio, will participate in the November technical session of the Dayton ASTE chapter.

Col. W. E. Carter

E. A. Irwin

The program will get under way at 7:45 p.m. at Suttmiller's Restaurant. Dinner will be served at 6 p.m. All members are encouraged to bring guests to this outstanding meeting.

Part of the Army's press program a huge 35,000-ton forging press being built by the E. W. Bliss Co. will be located upon completion at the Kaiser Aluminum Co. Overall, it will stand approximately nine stories high and will be able to stamp out at a single stroke air frame parts that under conventional methods take many man-hours of machining operation.

Col. Carter will discuss the origin of the heavy press program, its ultimate effect on the defense program of the A.M.C., and the general forecast as to the uses in civilian production. Mr. Irwin will discuss manufacturing problems, engineering design problems and will compare the equipmentt to that which is now in use. Press uses at Kaiser Aluminum Co., plant facilities for this equipment, and tooling and maintenance will be covered by Mr. Moore.

Chapter News Directory

University Conference Set for November 8

Highlighting ASTE activities during the month of November is the Second Annual Tool Engineering Conference to be held at the University of Illinois in Urbana on November 8. Sponsored by the Chicago chapter in cooperation with the mechanical engineering department and the extension division of the university, an intensive program of current interest is planned for ASTE members from chapters in Illinois, Indiana, Wisconsin and Western Michigan. More than 500 are expected to participate.

A round table discussion of carbides and their application will feature representatives from leading carbide manufacturers and important industrial users who will review solutions to carbide problems and discuss their experiences with carbides.

Taking part in the discussion on "Engineering the Carbide to the Job" will be: Matt Aljanich, superintendent of tool cribs, Caterpillar Tractor Co., Peoria, Ill.; W. L. Kennicutt, chief engineer, Kennametal, Inc., Latrobe, Pa.; J. S. Kozacka, professor of mechanical engineering, University of Illinois, Navy Pier, Chicago; Fred Lucht, development engineer, Carboloy Department, General Electric Co., Detroit; L. B. Monosmith, director of research, Sundstrand Machine Tool Co., Rockford, Ill.; A. O. Schmidt, research engineer, Kearney & Trecker Corp., Milwaukee, Wis.; and K. J. Trigger, professor of mechanical engineering, University of Illinois, Urbana.

ASTE's national professional engineering committee, headed by C. M. Smillie, will present a program designed to foster professional development within the field of tool engineering. A panel discussion will be offered by leading engineers and members of boards of registration of midwestern states on the topic, "The Value of Professional Engineering Registration."

Other talks are being planned on the subjects of "Safety in Tool Engineering," "The Tool Engineer and Work Simplification," and "Precision Casting Processes."

In addition to these conference sessions, tours are planned of the Talbot laboratory, production and power laboratories, electrical engineering and electronics laboratories, the electronic computer laboratories and the 340-million volt Betatron.

Arrangements for the conference are under the chairmanship of L. E. Doyle, associate professor of mechanical engineering at the university and member of the Chicago ASTE chapter.

Chicago Chapter Host to National ASTE Officers

Chicago—First Vice President Roger F. Waindle and ASTE Treasurer Howard McMillen were guests of the Chicago chapter at the September meeting held at the Keymans Club. They addressed more than 150 members and guests who were on hand to learn about the leadership conference planned for next March, the $75,000 ASTE research fund and the operation of the Society's national finance committee.

Technical speaker Allan Gunderson, chief tool engineer, George Gorton Machine Co., spoke on "Pantography and Its Place in Modern Day Production." He told of the many applications of the high-speed machine, including embossing designs in steel plates for rug pads, cutting dies for lace paper doilies, making molds for alphabet soup and milling tip slot in propeller for defrosting.

One of the most interesting applications showed the milling of a small impeller. Using a 0.070 diameter cutter reduced the operation time from three hours to 30 minutes.

Lehigh Valley Members Hear Carrol R. Alden

Allentown, Pa.—Fifty members of the Lehigh Valley chapter met September 19 at the Hotel Traylor for dinner and a technical lecture by Carrol R. Alden, Ex-Cell-O Corp.

Mr. Alden presented a discussion on the use of Ex-Cell-O boring machines which was accompanied by slides and exhibits. His lecture subject was "Precision Machining of Mass Production Parts."

Charles S. Via

Carbide Tools Topic at New Orleans ASTE Session

New Orleans—The kick-off meeting of the autumn season was held Sept. 10 at Tulane University by members of the New Orleans chapter. A short business session was conducted by Chairman James Cypher and a brief outline of future programs was presented by Program Chairman John Sale.

The guest speaker, Milton J. Steffes, general sales manager, Super Tool Co., Detroit, was introduced by Mr. Sale and spoke on the topic "Carbide Tools."

Using slides to illustrate the manufacture of metal by the Carboloy Dept., General Electric Co., Mr. Steffes described the various processes from mixing the basic ingredients, tungsten, carbide and cobalt in powdered form, through the many stages until the finished product is acquired. A question and answer period ended the meeting.

250 St. Louis Members Attend Suppliers' Night

St. Louis—Attendance of nearly 250 St. Louis ASTE members helped make the chapter's "Suppliers' Night" held September 4 at the DeSoto Hotel, a success. Twelve suppliers from the St. Louis area presented displays and gave demonstrations of thread gages, snap gages, gage blocks, hardness testing equipment, comparators, and measuring devices such as vernier calipers and height gages.

A special dinner table was set aside for new members of the chapter. Introduction of those members who have joined the Society since the June meeting was made by Membership Chairman Warren Pouyer. Although only ten in this group could be on hand for the opening meeting of the season, 34 new names have been added to the St. Louis roster in the last three months.

Employment of the physically handicapped was pictured in the film "Investment in Human Welfare," presented by Charles S. Via of the Missouri Department of Education. The movie showed dramatically how the handicapped are successfully employed in industry and told how rehabilitation is aided by the Vocational Rehabilitation office of the Department of Education.

After the film and further discussion by Mr. Via, the program was closed with a question and answer session.

Mull Appointed

J. W. Mull, Jr., has been appointed sales representative for Indiana, Western Ohio and Northern Kentucky by the Sintercast Corporation of America, Yonkers, N. Y. He is a member of the Indianapolis ASTE chapter.

Pictured here are just a few of the 165 ASTE members of the Springfield, Mass., chapter who turned out for the annual clambake held this year at the Red Bar at Chicopee Falls. Activities for the day included a softball game, contests and the awarding of door prizes. Committee members who handled arranagements for the day were: Wendell Ingham, Clifford Harbeck, Wallace Metcalf, Walter Fasser, Jason Doubleday, Robert Dickson (first vice chairman), Stanley Stone, Hallis B. Moore (secretary), Walter Kucsek (entertainment chairman), Robert Marquiss (membership chairman), Peter Scott (second vice chairman), William Buckley (chapter chairman), Edward Curren (treasurer), William Ackerman, Richard Brown and Charles Stonerod.

Kenneth W. Riddle, president of the Education Foundation of the Philadelphia chapter, presents a scholarship award to Robert Hooper as other winners stand by. From left, are: Stephen Stamm, Dierk Rakula, Robert Hedley and Edward Croall. Also watching the proceedings is Clarence Hamilton, secretary of the Sheffield Foundation, a generous contributor to the scholarship fund.

Jet Velocity Topic at ASTE Technical Session

Boston—About 200 members and guests of the Boston ASTE chapter turned out for the opening meeting of the 1952-53 season. They met September 11 at New England Mutual Hall for dinner followed by a business meeting and a technical session.

B. R. Walsh, Gulf Research and Development Co., was the program speaker. Head of the industrial engineering section, Mr. Walsh spoke to the chapter on "Importance of Jet Velocity in the Improvement of Tool Life."

Seaton, Wilson Join Los Angeles Company

Charles Seaton, San Fernando Valley ASTE member, and Ray Wilson have joined the Hollywood Mfg. & Supply Corp., Los Angeles, Calif., as vice presidents, according to a recent announcement. Mr. Seaton was formally chief tool engineer, Pacific Div., Bendix Aviation Corp., where Mr. Wilson served as chief industrial engineer.

Maidens Named Manager

J. T. Maidens, Fort Wayne ASTE member, has been transferred from the Indiana territory and has been appointed manager of the Philadelphia territory for Morse Twist Drill & Machine Co., New Bedford, Mass., according to an announcement made by Charles F. Myers, vice president.

Praises Survey Made by Long Island Committee

Garden City, N. Y.—ASTE's national education chairman, A. R. Diamond, was a guest of the Long Island chapter at the group's September meeting. Before an audience of more than 100 members and guests at the Garden City Hotel, Mr. Diamond gave high praise to the chapter's recently completed survey of educational requirements for tool engineering. The survey was taken by means of questionnaires and is reported to be the first ever attempted by a chapter of the Society.

A technical address on the principles and practice of resistance welding was presented by William J. Farrell, chief application engineer, Sciaky Bros., Inc., Chicago.

With the aid of a blackboard and a series of pertinent slides, the speaker covered the principles of resistance welding theory and discussed the applications of the process to airframe and jet engine manufacturing. He also gave applications to mass production in civilian industry with comparable cost analysis with other methods of fastening.

A *Tool Engineers Handbook*, the chapter's door prize, was presented to Robert Bonniwell by Mr. Diamond.

Twin City Dinner Dance Attended by 140 Couples

Minneapolis—A dinner and dancing party at the Radisson Hotel was held September 13 by the Twin City ASTE chapter. Entertainment was provided by Dick Weston, ventriloquist, and a humorous monologue was delivered by Ralph Seydel. Dance music was furnished for 140 couples by Hal Garven and his orchestra.

Corsages were presented to the ladies by the chapter. A long list of prizes was donated by more than 60 business and industrial firms in the area.

Arrangements for the party were handled by Felix L. Mertesdorf, chairman, and Arthur Stockwell, accommodations; Bertil Peterson and Kip Hollenbeck, entertainment; Carl Carlson and Lewis J. Anthonsen, prizes; Walter Haas, flowers; D. D. Gerard, ticket sales; Phil Armstrong, treasurer; and Murrel Kautz.

On September 3 the chapter met at Dunwoody Industrial Institute for dinner and a speech on "Patents for the Engineer" presented by William C. Babcock, patent attorney for General Mills. He clarified many problems in securing a patent and illustrated his talk with slides and drawings to demonstrate the wide scope of patentable ideas.

Discusses Tooling for Resistance Welding

Indianapolis—About 200 members of the ASTE chapter in Indianapolis attended the first meeting of the 1952-53 season called to order September 4 at the Sahara Grotto by Chairman Denis White. Dinner preceded the technical program by F. A. Bodenheim, Jr., sales manager, Federal Machine and Welder Co., who spoke on "Tooling for Resistance Welding."

Before his talk, Mr. Bodenheim presented a comprehensivee movie titled "This Is Resistance Welding," which covered spot, projection, and seam welding of a wide variety of materials. Tooling methods on a "do" and "don't" basis were emphasized.

Edward A. Berzina and Edward Kimmell of the Cleveland Twist Drill Co. presented the technical program for the Springfield, O., chapter's September meeting. Shown here are: Kenneth Forsell, chapter chairman; Mr. Berzina, Mr. Kimmell and Harry A. Webb, program chairman. The session was held at the Towne Room of the Hotel Bancroft.

Stresses Tooling Phase in Planning New Program

Alviso, Calif.—Harry Conn, chief engineer, Scully-Jones and Co., Chicago, was the featured speaker at the September 16 meeting of the Santa Clara Valley ASTE chapter. About 75 members and guests gathered at Vahl's Restaurant for a chicken dinner and technical session on production tooling problems.

When opening his discussion, Mr. Conn said that more thought should be given to the tooling phase of a new program than has been exerted in many cases since inadequate or poorly designed tools raise costs on every part produced.

Tapping fixtures and tap drill holes should be carefully gone over for size and correct alignment. "About 90 per cent of all taps used are broken, rather than worn out," the speaker said. He recommended that 60 per cent thread be used rather than the 75 per cent that is commonly used.

On August 19 the chapter held a dinner meeting at Dinah's Shack in Palo Alto and heard a discussion on application of screw machines delivered by Thomas F. MacLaren, manager of the Los Angeles office of Brown and Sharpe Mfg. Co.

Business Session Opens Fall Meetings

Elmira, N. Y.—Business notes were the chief subjects under discussion at the first fall meeting of the Elmira ASTE chapter held September 8 at the Mark Twain Hotel.

The International Area Meeting was discussed and a joint plant tour of the Ithaca Gun Co. with the Binghamton chapter was planned. Dinner, four reels of sports movies and the social hour rounded out the evening.

Santa Clara's new program format gets the attention of T. F. MacLaren, V. E. Diehl and G. W. Hilton.

Tour Shows Methods of Textile Manufacturing

Brantford, Ont.—A tour of the Slingsby Mfg. Co. on September 12, manufacturers of woolen and synthetic fabrics, opened the autumn schedule of meetings for members of the Hamilton District ASTE chapter. The program began with dinner at the Brant Hotel and was highlighted by a talk on the textile industry made by Ernest Pussey, plant superintendent of the company.

Mr. Pussey gave a brief description of the two divisions of the firm. Then using samples for illustration, he detailed the various processes necessary in turning out the finished fabrics.

After Mr. Pussey's discussion, the members adjourned to the plant to see all of the many operations he had described. The group concluded its tour in the plant sample room where the many different fabrics were on display. A blanket made by the Slingsby Co. was presented to Alfred Horner as a door prize.

The meeting was conducted by Chairman William Shaw. George Churchill introduced the program.

Reviews Applications and Uses of Pivot Punches

Rochester—The first meeting of the news season and the 131st consecutive meeting since the Rochester chapter was chartered was held September at the Barnard Exempt Club. After Chairman Charles DeMartin introduced the new members to the chapter and announced that the budget committee had made arrangements for an appropriation to stimulate increased membership in the chapter and better attendance at meetings.

The Technical speaker, Edmund J. Klonoski, general manager, Pivot Punch & Die Corp., spoke on the topic "Pivot Punches, Their Use and Application." After the lecture, an informal question and answer period stimulated a discussion on individual applications of Pivot punches.

Tulsa Program Highlights Tooling for Plastics

Tulsa—A get-acquainted dinner meeting launched the Tulsa chapter on its second year of ASTE activities. About 80 members and guests met at the Bliss Hotel September 11 for a buffet dinner and a technical session on "Tooling Aspects of Plastics."

The program speaker was Don Boggs, engineer for Vulcan Tank Co., Tulsa. He pointed out that the plastics industry is relatively young and much ingenuity in tooling for plastic products is required since manufacturing equipment is not generally available.

Obituaries

Charles E. Paige

Charles E. Paige, chapter member of the Portland, Me., ASTE chapter, died suddenly September 7th at his home in Belfast, Me. Associated with the Mackenzie Machine Co. of Cambridge, Mass., at the time of his death, Mr. Paige served as chairman of the Portland chapter in 1943 and 1944. He was elected secretary when the chapter received its charter in 1941 and served in that position from 1945 to 1947. Before joining the Mackenzie firm, Mr. Paige was a sales engineer with Edwards and Walker, Portland, and the Woodis Machine Tool Co.

Morris Handelman

Morris Handelman, ASTE member of the Detroit chapter, died September 18 at the age of 38. A registered professional engineer, Mr. Handelman was a senior engineer with the Moynahan Bronze Co., Flat Rock, Mich. He had formerly been associated with the Ford Motor Co. as a process engineer.

A program presented by the Verson Allsteel Press Co., Chicago, was featured at the September 8 meeting of the Evansville chapter held at the Hadi Shrine Temple. Speakers were Melvin D. Verson (second from left) and Emmett J. O'Connell (second from right). Shown with them are Bernard Pampi, left, and Henry Appel, right, who was program chairman. The coffee speaker, Leon Balkin, gave a short talk on "Local Sports Highlights." More than 110 members and guests attended.

70 Worcester Members Participate in Outing

Worcester—Under the direction of Harold L. Jones, entertainment chairman, the annual outing of the Worcester ASTE chapter was held September 6 at the Hillcrest Country Club, Leicester. About 70 members participated in the day's activities which included dinner, golf and field events.

Winners of prizes in the golf tournament were George Groves with a low gross score of 88, Carroll Morse with a low net score of 75, and George Lyman, Bob Karakoosh, John Phillips, Leslie Laughton, D. Sangster and Paul Garlock. Floyd Harris was in charge of the tournament.

Other events included a hole-in-one contest, shoe-pile contest and horseshoe competition which were run off by Andy Peterson, Don Eaton and Franklin Angevine.

Prizes were donated by John Bath Co., Lodding, Inc., Robert Morris Co., Floyd Harris, Johnson DeVou Co., Worcester Gear Works, Parker Mfg. Co., Lindco, Inc., Massachusetts Steel Treating Co., Rawling Gear Works, George Blake Co., West Brookfield Co., Harry Orr, and Ramsdell Industrial Supply Co.

Plant Layout Covered at Saginaw Valley Meeting

Frankenmuth, Mich.—A highly successful meeting on September 18 opened the fall season of meetings for the Saginaw Valley ASTE chapter. More than 150 members met for dinner and a technical session at the Zehnder Hotel.

Speaker for the evening was James M. Apple, associate professor of industrial engineering at Michigan State College. Author of a book on plant layout and materials handling, Mr. Apple gave a talk on the necessary steps and available tools for effective plant layout. He used slides to illustrate his lecture.

Kennametal Appoints Chicago District Manager

Announcement has been made by Kennametal, Inc., of Latrobe, Pa., of the appointment of Fred Hennig, Jr., as manager of the firm's Chicago-Midwestern district. A member of the Pittsburgh ASTE chapter, Mr. Hennig is an industrial engineering graduate of the General Motors Institute, Flint, Mich. Before his association with Kennametal in 1943, he spent 15 years in all phases of production and tool engineering at the Delco Appliance and Rochester Products Division of General Motors Corp.

Coming MEETINGS

BOSTON—Nov. 13, New England Mutual Hall. "Hydroform Principles and Applications" by Charles Heimlich and Carl Bacon.

CHICAGO—Nov. 3, Keymans Club. "Aluminum Die Casting" by F. D. Sanborn, Aluminum Co. of America, Bellwood, Ill.

CLEVELAND—Nov. 14, "Jig Design and Operational Technique" by Frank Zagar, Zagar Tool, Inc., Euclid, O.

COLUMBUS—Nov. 12, 6:30 p.m., Columbus Maennechore. "Methods of Reasoning for Tool Design" by Joseph I. Karash, Reliance Electric and Engineering Co., Cleveland, O.

GRAND RIVER VALLEY—Nov. 7, "Taps and Tapping Problems" by Glen Stimson, Greenfield Tap & Die Co.

GREATER NEW YORK—Nov. 3, "Die Hobbing" by Islyn Thomas, Thomas Mfg. Corp., Newark, N. J., and Edmund Spitzig, Newark Die Co.

LONG ISLAND—Nov. 10, 8:30 p.m., Garden City Hotel. "What the Tool Engineer Means to Industry and What Industry Means to the Tool Engineer" by Thomas J. Donovan, Jr., president, Donovan Co., Philadelphia, and national director of ASTE. Speaker will also deliver a message on recent news of national ASTE activities and future plans of the Society.

MILWAUKEE—Nov. 13, "Metal Cutting Tools" by Eugene L. Zimmerman, sales engineer, Illinois Tool Works, Chicago.

NORTHERN NEW JERSEY—Nov. 11, "Tungsten Carbide for Die Applications" by P. F. Rehner, Allegheny Ludlum Steel Corp., Detroit.

PITTSBURGH—Nov. 7, 6:30 p.m., Hotel Webster Hall. "What Tool Engineering Can Do for Your Company" by J. R. Weaver, assistant to vice president in charge of manufacturing, Westinghouse Electric Corp. Coffee speech by C. V. Briner, sales manager, gage and tools div., Pipe Machinery Co.

PORTLAND (ME.)—Nov. 14, "Uses Unlimited" by K. J. Cumming, Micro Switch, Freeport, Ill.

ROCKFORD—Nov. 13, Lafayette Hotel, "Tips on Application and Fabrication of Stainless Steels" by E. Von Hambach, research and development engineer, Carpenter Steel Co., Reading, Pa. Dinner meeting.

SAGINAW VALLEY—Nov. 13, 7 p.m. Tour through plastic laboratory, Dow Chemical Co., Midland, Mich.

ST. LOUIS—Nov. 6, 6:30 p.m., DeSoto Hotel, "Tailoring Motors to Machine Tools" by M. F. Aynes, assistant sales manager, Louis Allis Co., Milwaukee.

SPRINGFIELD (ILL.)—Nov. 4, "Tooling for Plastics" by Wayne I. Pribble, president, Barrier-Pribble & Co., Inc., New Haven, Ind.

TRI-CITIES—Nov. 12, 6:30 p.m. Rock Island Arsenal. "Cutting Tools" by Louis Goddard, vice president, Goddard & Goddard, Detroit.

R. R. Mitchell, General Motors Corp., (holding slide), spoke to a large audience of Windsor ASTE members at the chapter's September 8 meeting held at the Prince Edward Hotel. He gave a technical talk on "G. M. Standardization Activities Relating to J. I. C. Standards." Pictured with Mr. Mitchell are, from left: D. C. Heath, Windsor, chairman; David Barnett, master mechanic at Windsor plant of General Motors; and D. K. MacDonald, plant manager at G. M.'s Windsor plant.

News of Portland, Seattle Chapters

By Andrew E. Rylander

This time I've plenty of grist for the mill, having toured Oreegon, Washington and British Columbia along with attending the September meetings of Portland and Seattle chapters. For that, thanks to my friend B. N. (Penn) De Rochie, Jr., who invited me along if only for riding company. And what a trip!

While attendance at the Portland meeting left something to be desired, it so happened that a changed meeting date coincided with a football game in which the sons of several of the members were doing their bit for "dear old Rutgers." And what father would let his boy down at a time like that! Nevertheless, the chapter now shows promise of a healthy growth due to increasing recognition of tool engineering on the part of local industries—and it may be added, to an aggressive campaign on the part of the chapter officers.

Guest speaker was Harry Conn of Scully-Jones & Co., who has been touring the West Coast chapters. Harry, who is a sincere and earnest speaker, gave a most interesting talk on tapping problems. He should find a ready welcome on a return engagement.

First on the visiting list was Dan Melody, up 'n' coming Portland chapter ch'man whom we had to catch before breakfast. Dan is on the ball! Then, a visit to Willamette Iron & Steel where Fred Mondin, late of Detroit and Pontiac chapters, is hard at work on a modernization program.

What impressed me particularly was the *esprit de corps* of the entire organization. From the top down, everybody had a good word for Fred: "He's doing a swell job!" Well, you know how it is; even the best driver can only move as fast as the traffic ahead, apropos which a progressive management is not only encouraging modernization but actually setting the pace.

Throughout the organization, considerable interest is being evinced in tool engineering, as a result of which Fred expects to bring in some highly qualified men into the ASTE fold. While there, met Philip E. Thayer, G. M., also a comparatively recent arrival on the scene whose thinking is as modern as tomorrow; Carl Johnson, fabrication sup't, Roy Bowman, production mgr., and Dick Lyons, staff assistant to Fred.

At George E. Zweifel & Co., I met a young chap by name Elmer Beers. Now sales engineer, Elmer has unusual engineering ability and is further qualified by virtue of technical and practical backgrounds. At Zweifel's, I also met John Neronsky, West Coast field engineer for Jones & Lamson and located in Los Angeles. Through him, relayed greetings to Floyd McArthur and other *auld acquaintance* at J. & L.

At the Seattle meeting, where Jim Smith acted as official greeter, I got a bit mixed up when, talking to ch'man Anthony J. Gembolis, I heard him called Joe instead of Tony, and so figured I'd braced the wrong guy. As at my previous visit, the chapter meeting was well attended and enthusiastic. Among other business, Carl Carlson—one of the wheel horses in the chapter—was sworn in as Treasurer by Past-Ch'man Bud Coenen.

The boys were a bit nonplussed over applications for membership by a twain of the fair sex, but I assured them that they were as welcome as the flowers in May—if qualified. On a visit to the Boeing plant, I had occasion to see the work being done by one of the ladies—Diane Vaughnn—and can fully attest to her engineering know-how.

The visit to the Boeing plant was on invitation by John Lee, leader of the Boeing Document Group who wanted me to see their optical tooling setup—or, as they term it, "optical planizing." There, while being shown around by Verne Mades—chairman of the optical control and chief optical tooling research engineer—I met Grumman's Art Cervenka, 1st v. c. of Long Island chapter, ASTE, also interested in optical tooling. Others in the optical tooling division include B. K. Bucey, tool design engineer, and Ed Carpenter, research and developmentt supervisor.

On return to the hotel—we stayed at the Olympic—I had a message from Jim Cumming who also wanted to show me a Boeing development but time pressing, had to forego a return visit. Another time—I hope. Harvey Huffum, who had been in charge of tooling the Boeing eurbine engine, has been stepped up and is now in charge of production planning on experimental work at the Boeing Renton plant. Just can't hold good men down nohow.

Among other plants, visited the Pacific Car & Foundry, where we were shown around by Ray Husted, assistant advertising manager. To describe everything seen in a 2-hour tour would take all my space: this much I can say, however, that few if any plants can boast of such wonderful "housekeeping." To describe it as merely ultra-efficient would be sheer understatement.

Also was privileged to visit the Isaacson Iron Works, where giant hydraulic forging presses were kneading huge ingots as though they were made of putty. There, in addition to collosi for the lumbering industry, I had occasion to see a trepanning job on a large naval propellor shaft. However, they were a bit cagey about discussing the technique and I didn't want to wear out my welcome by being insistent about a method with which I am already familiar.

All told, we got around to a score of plants, some big, some small, and all indicative of progressive managements. Stopping for lunch enroute, met Fred Allen of Portland chapter and Ira Simpson of Los Angeles, both representing Standard Tool Co. of Cleveland.

Back in Walnut Creek, I found that I'd missed the daughter and son-in-law of Detroit ASTEer, Henning Freden, by a scant few minutes, the couple having arrived just after we pulled out for the north. Also had a message from Veep Roger Waindle, who'd hit the Coast during my absence. But then, I can't serve the ASTE sitting on my stern in Walnut Creek.

Guests at the Portland, Ore., September meeting, Harry Conn (left), chief engineer at Scully-Jones & company, and Andy Rylander (second from left), West Coast representative of ASTE, discuss a few program notes with Portland members. Shown here are: Walter Brenneke, immediate past chairman of the chapter, Fred Allen and Ken Self.

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News in Metalworking . . .

SEVENTEEN HEAVY PRESSES TO SPEED AIR FORCE PRODUCTION

Seventeen presses, which are expected to surpass in magnitude of operation any ever before built in this country, are now under construction at various points around the United States under the direction of the U. S. Air Force. The machines are being built to turn out large aircraft and engine parts. According to the plan which sponsored the idea, the heavy presses—eight extrusions and nine forges—will whittle the present time requirement to a fraction.

At the moment there is necessarily a great deal of uneconomical "bits-and-pieces" assembly resulting from putting together a lot of small pieces into one large one. In the future, a whole wing section, ribs, frames or spars will be stamped out in a single operation. Now the Air Force is handicapped by press equipment limitation. There are three in the United States, and this is only a recent total, since before the Air Force brought two from Germany in an effort to break the production bottleneck, the single 18,000-ton machine at the Wyman Gordon plant in North Grafton, Mass. was the only heavy press here. In addition, this machine although it is turning out sections of the landing gear for B-47's and spars for F-84's, is 3,000 miles from the West Coast, where half of the aviation industry is located. The two German imports, with 16,500-ton capacities each, have been located at the Alcoa plant in Cleveland and at Bohn Aluminum and Brass Co. in Adrian, Mich., but only now are getting into production.

Before making the production change to heavy presses, a comprehensive study of details of the job was made by the Air Force together with representatives of the aviation industry, and men from companies which would build the presses and those who would operate them. Prior to this study there was little information available on heavy presses.

Advantages of the heavy presses are their ready adaptability to handling new shapes and that they will last many years. While modifications on airplanes are being made constantly, these mainly apply to aspects of the plane's performance and requirements. The F-80 Shooting Star, for example, has gone through many model changes since its beginning in 1942 but the basic structure is the same. Even in the case of an entirely new design, only the die block would have to be changed, and these could be used on the same press.

Research with magnesium and the newer high-strength aluminum alloys discloses that these metals can be efficiently handled in no other way. Under a press they flow; under the impact of a hammer blow, they tend to shatter.

In dollars and cents, the Northrop Co. has estimated a potential saving of $1-million on 500 of its F-89's if a heavy press could have been used to forge the light alloy parts. At the same time, the Air Force report shows that on another model, use of forgings would reduce the labor by more than 1,500 man-hours per airplane. Reductions possible in quantities of material are emphasized by the figures for a wing panel weighing 110 lb. The piece can be "hogged out" of a slab weighing 480 lb, or it can be forged out of a billet weighing 120 lb—a flat saving of 360 lb. Allied with the saving is the attendant reduction or elimination of rivets, bolts and spot welds. On the B-47, replacement of a welded steel bulkhead structural member by a single forging should save about 178 man-hours and about $700 per plane.

PLASTICS EXTRUSION STUDIED

Advances in plastics manufacturing know-how which signal the way to improvements in processing many of the plastic products used today, were discussed in the reports of a six-man Du Pont team which has been doing a lot of research on the subject. The findings, reported at the recent American Chemical Society meeting, will make improvement in design and productivity of machines known as extruders possible for manufacturers without the necessity of investment in expensive laboratory equipment.

Plastic piping, wire insulation and many other products are made in extruders in which melted material is forced through openings shaped like the desired finished product. However, a wide difference in opinion exists about how these machines should be designed and run, since little is known about the basic principles of their operation.

Although the two-year-old research program is little more than a good beginning, in the field, the scientists' reports made clear that considerable progress has been made in correlating the theory of plastic extrusion with practice through the application of mathematical equations or experiments in relatively inexpensive model machines. Three concrete achievements have been made: 1. a better understanding of the basic theory of extrusion from scientific literature and by evolving new ideas; 2. derived mathematical equations for determining how melted plastics behave as they flow through an extruder; 3. practical application of theory and equations by experiments in scale model and full-sized machines.

ANOTHER "LARGEST" GOES INTO PRODUCTION

What is believed to be the first extrusion installation in the United States for hot forming of steel shapes by the Ugine-Sejournet process has been designed and built by Hydropress, Inc. The machine which has a capacity of 2,500 tons, is now being successfully operated by The Babcock & Wilcox Co. Tubular Products Div. The Ugine-Sejournet process involves using glass as a lubricant. Another 2,500-ton Loewy-Hydropress extrusion installation for manufacturing by the same method will go into operation shortly.

ALLIED PRODUCTS EXPANDS

The addition to Allied Products Corp. has been completed and is now in operation at Hillsdale, Mich. Although the plant is normally engaged in manufacture of hardened and precision ground parts, it is presently at work in the production of aircraft engine parts for jet and piston engines.

BORG-WARNER BUYS ATKINS

E. C. Atkins and Co. of Indianapolis passed formally into the hands of Borg-Warner Corp. with the recent election of Stanley J. Roush as president and general manager. It now will be known as the Atkins Saw Division.

Elias C. Atkins, who is relinquishing the presidency of the company his grandfather founded a century ago, and W. A. Atkins, previously a vice-president of the company, were elected members of the board of directors. Vice presidents of the division will be H. G. Ingersoll, who also is a vice-president of Borg-Warner and president of its Ingersoll Steel Division and L. G. Porter, who also is treasurer of Borg-Warner. D. H. Potter, secretary-treasurer of Atkins prior to the change, will continue in the same capacity.

The new division becomes Borg-Warner's fifth in Indiana.

OIL MIST LAUDED

Significance of oil-mist lubrication was pointed out as one of the outstanding technological developments in the manufacturing field by E. R. Harris when he addressed the annual convention of the Association of Iron and Steel Engineers. Mr. Harris spoke on "Oil Mist Lubrication for Industrial Machinery." During the past several years, he said, management is becoming conscious of the important benefits to be derived from better lubrication procedure. At the same time, manufacturers and designers are striving for greater productivity, recognizing the need for better bearing design and strict adherence to lubrication schedules.

The attractive feature of oil mist is its function is continuous and automatic, overcoming one of the possibility of human error which is one of the greatest problems in industry.

Lubrication by this method is through a low pressure, controlled air stream in which microscopic particles of oil are airborne. Oil mist is produced by a lubricator which has no moving parts and only two simple adjustments—one regulating the flow of oil, the other controlling the air pressure. Pressure within the system is maintained through use of fittings of controlled opening which deliver prescribed amounts of oil to the point of end use. Oil is delivered in the form of mist by means of a "mist" fitting; solid oil, through conversion of mist to oil in a condensing fitting; or by spray method to exposed areas such as cams, gears or chains by a spray fitting.

DESIGN CONTEST OPENS

Designers, engineers and manufactures of machinery of all types will have an opportunity to compete in a contest sponsored by The James F. Lincoln Arc Welding Foundation of Cleveland, Ohio. The Mechanical Design Award Program offers $30,000 in cash awards as well as national recognition, for the best papers describing the mechanical design and construction of any type of machine component which is designed for arc welded steel fabrication.

The competition is divided into 18 different fields, in each of which will be presented a $500 first, $250 second and $150 third prize. In addition there will be honorable mention awards as well as grand awards to the eight best-of-program papers.

Among the 18 divisions subjects are metal cutting, metal forming, jigs, fixtures and tooling, metal making and refining, electrical and conveying.

The papers will be judged by a jury of engineers, educators, designers and fabricators selected from men prominent in industry and education.

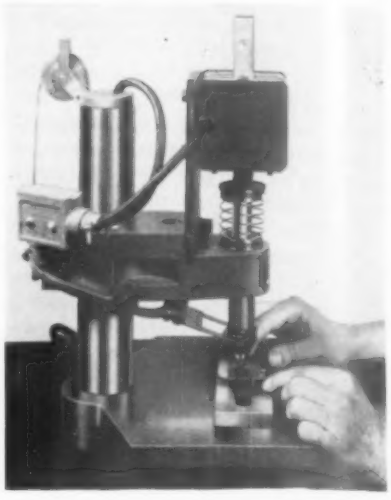
Tools of Today . . .

Staking Machine

An all-electric staking machine called Electrostake has recently been developed by Black & Webster, Inc. Dept. N88, 445 Watertown St., Newton 58, Mass. Basic improvement over conventional stakers consists of powering the machine by a solenoid rather than the spring-loaded trip hammer used on most conventional stakers.

The solenoid operation, plus several other features, reduces operator fatigue to a minimum, makes possible 25 to 50 percent increase in production and provides complete safety for the operator. Both the hold-down pressure and the staking blow are fully adjustable.

A portable machine, the Electrostake is suitable for any assembly-line operation where two or more assembled parts



must be pressed firmly together and then staked or riveted with a sharp blow. Staking, riveting, eyeletting, upsetting and rolling can all be accomplished on the machine. Typical applications include assembly and subassembly work involved in manufacturing instruments, clocks, electrical components, cameras and many other small products.

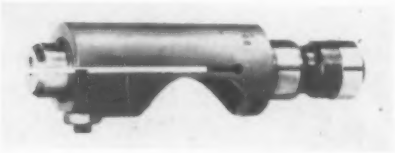
The electrically powered work stroke enables the worker to operate the Electrostake by lightly touching a foot treadle (similar to a foot switch). Both hands are left free to hold work steady in the fixture with complete safety. Solenoid power eliminates the need for long, tiring swings of the foot, which are required to operate a staking machine equipped with spring-loaded hammer action.

Both the staking blow and the hold-down pressure of the Electrostake are fully adjustable to enable the same machine to handle many jobs. Three Electrostake models are available for various job requirements. Largest model con deliver a maximum staking blow of 3000 pounds impact. When the force of the blow is set, it remains the same until readjusted. The impact of the staking blow is always uniform because it does not depend on the operator's judgment. Complete adjustability to accommodate any size work is provided as the whole bracket assembly and hold-down sleeve are easily raised or lowered above the base. The hold-down pressure which can be preset from a few ounces to 10 pounds does not vary during the staking operations. Slight variations in thickness of the work have no effect on the force of the staking blow. The staking blow always remains uniform at its predetermined setting.

T-11-921

Air Gaging Plug

Moore Products Co., Philadelphia 24, announces the development of a contact-type gaging fixture for measuring work which has coarse surface finish. Fixtures of this type are interchangeable in standard Moore pneumatic comparator gage stands.



The contact-type gaging plug measures bores in which the finish varies from 20 to 125 microinches. The upper part of the fixture, which is rigid and capable of supporting the weight of the workpiece, contains a pneumatic measuring nozzle. The lower part, which is flexible, contains the nozzle seat. When the work is placed over the end of the plug, the clearance between the nozzle and nozzle seat corresponds to the minimum diameter of the bore.

For calibration, standard ring gages are used as masters. Dimensions are shown on the calibrated dial of the bourdon tube indicator in the standard gaging stand.

Other fixtures are designed for measuring the maximum OD of coarse-finish parts. In both styles, the nozzle is completely protected. External mechanical contacts, which are subject to clogging and damage, are eliminated.

T-11-931

Thread Roller

An unprecedented 19,440 pieces-per-hour is the rate at which external, class 3 fit threads are rolled in ½-13 hollow set screws of S.A.E. 1035 steel on the model 300 Prutton Rollmaster thread roller, introduced by D. H. Prutton Machinery Co., 5295 W. 130th St., Cleveland.

The machine is said to perform comparably on either hollow or solid work in a wide variety of metals ranging from nonferrous, through aluminum and magnesium, to hardened and stainless steels.

According to the company, the planetary die principle reduces thread rolling pressure by distributing it evenly over a full 30 inches of die length. Thus the danger of distorting or crushing hollow parts due to excessive pressure from shorter dies is eliminated.

Pieces are hopper-fed, and roll at close intervals around the circumference of the die. The large numbers of pieces in work at a time make possible slower die speeds, less wear and a proportionate extension of die life.

T-11-932

Variac® Control

Designed for light production work where a ¾-horsepower motor is used, this control uses no electronic tubes and so takes no warm-up time. Instant starting and reversing are provided together with strong dynamic braking.

Production time is saved when this control is used. Typical applications are on lathes, for instance, where several operations are done on the same piece at different optimum speeds; or for operations such as blind tapping where gradual starting and stopping is desired.

The compound-wound motor used with the Variac speed control has much better starting characteristics than the usual induction motor, and so starts faster and heats up less under repeated starts, stops, or reversals.

The construction and circuit are similar to that used in earlier smaller controls. A single, relatively small unit, in addition to the motor, contains all parts, and is arranged for simple installation. For further information, write General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass.

T-11-941

Jet Engine Starters

Small, airborne gas turbines for starting jet engines without the aid of ground power units have been announced by the General Electric Company's Aircraft Gas Turbine Division.

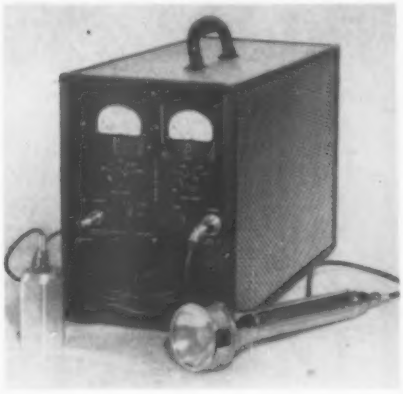
Two types of starters have been developed to meet the varied engine requirements. One type is powered by the hot gases resulting from the burning of a solid propellant in a replaceable cartridge. The other type of starters is powered by the products of the combustion of jet fuel and compressed air.

In the solid propellant system, the energy for the start is provided by the burning of a solid fuel contained in a cartridge in a breech. A fast burning charge, looking very much like an artillery shell, is inserted in the breech and ignited electrically. **T-11-942**

Balancing Machine

The model 652 Vibratron is a portable and simple to operate electronic machine for the analysis, evaluation, and correction of vibration. The Vibratron will measure accurately and without computation the amplitude and frequency of the vibration and, by means of a stroboscopic light, discover the source. It consists essentially of a vibration pickup, a multi-channel electronic circuit, and a stroboscopic lamp. It operates on 110-volt 60 cycle current.

The model 652 Vibratron is a maintenance and production as well as a research and inspection machine. As maintenance equipment it can be used to discover and correct unbalance in manufacturing equipment to prevent loss of accuracy and discover and correct sources of equipment wear, thus



helping to prevent breakdowns and costly repairs. It can be used to synchronize machine speeds and as a detection device for eliminating undesirable vibration from inside or remote sources. As production balancing equipment the Vibratron can be integrated with a test stand for economical dynamic balancing of rotating parts in the range from 600 to 40,000 rpm, or as a final production step in balancing complete machines before shipment to customers. By means of four-step switch in the amplitude circuit, meter readings can be obtained in full scale from 0.0001 to 0.1 inches peak to peak.

A feature of the model 652 Vibratron is its velocity-type vibration pickup which will withstand repeated drops on concrete floors and extreme rough treatment without failure or loss of accuracy. Pickup output is 82 millivolts at 0.001 inch deflection at 60 cps.

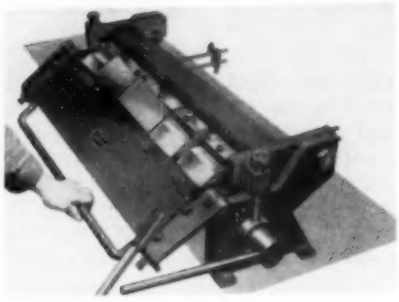
Made by International Research and Development Corp., 908 West Third Ave., Columbus 8, Ohio. **T-11-951**

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Bending Brake

A bench model, hand-operated, universal box and pan brake is announced by Dries & Krump Mfg. Co., 7400 South Loomis Blvd., Chicago 36. Known as size BB-2, this is the latest addition to the Chicago line of hand-operated and power bending brakes for bending sheet metal and steel plate.

This machine is designed to be mounted on a workbench for convenience and operating ease. With a capacity for any bending operation on sheet metal up to 18-gage and 24 inches long, it is ideal for model and experimental shops. Production departments will find



it useful for quantity runs on duplicate parts.

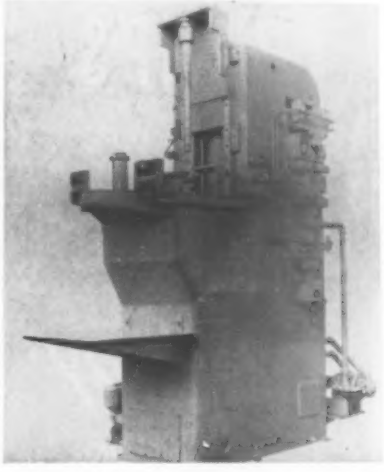
The bending edge is made up of fingers in graduated widths fitted to a bar. These fingers are easily adjusted or removed as the work requires. They can be used in any combination anywhere along the bending edge for folding, box and pan work, and a variety of straight bending operations. The positive, cam-action clamp is quickly adjustable for different thicknesses of material.

The bending leaf is a steel plate hinged in needle bearings for easiest operation. Angularity of bend is controlled by adjustable stop assuring accuracy in duplicate work. T-11-961

Broaching Machine

The American PD-5-25-48 pull down broaching machine is equipped with interchangeable base fixtures and tooling for broaching round and serrated holes approximately 3¼ to 3½ in. in diameter.

Inherent stability has been built into the machine by having the machine slide and retriever slide move on the same ways. The retriever guides the rear end of the broach down through the major portion of the cutting stroke.



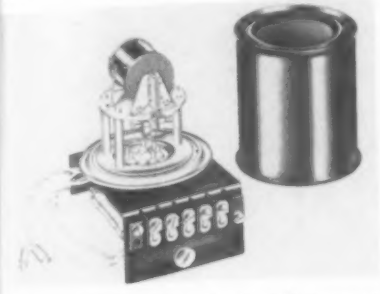
With the broach held securely at both ends during most of the cutting stroke, misalignment and vibration are minimized. An electrical interlock between the retriever and machine cycle automatically stops the cycle if, by any chance, the pull head should fail to connect with the broach. The hydraulic receding work slide, which is also interlocked to the machine cycle, facilitates loading and increases productivity. This machine is ideally suited for the broaching of parts too heavy or awkward to handle on a pull-up broaching machine. For further information write the American Broach & Machine Co., 415 W. Huron, Ann Arbor, Mich.

T-11-962

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Sensitive Inverter

The development of a synchronous inverter having a sensitivity of 0.05 microvolt and a dissymmetry of less than 0.01 percent has been announced by The Bristol Co., Waterbury 20, Conn. Known as the Bristol Syncroverter switch, this inverter is capable of converting low-power d-c signals, as low as 0.05 microvolts, to alternating voltages that can be amplified and applied to electronic, electrical and servo systems.



The Syncroverter switch will operate at any frequency from zero to 3500 cycles. It is designed for precision use in electronic computers, instruments, gun directors, null detectors, and many other similar missiles. Instantaneous operation and length of life are not affected by vibration or shock.

Errors due to thermal emf are eliminated by the use of two single-pole double-throw contacts. The contact-carrying armatures are of such low mass that their mechanical response is practically instantaneous. The inverter is free from resonance effects. It is hermetically sealed against dust and corrosion.

The Syncroverter switch is also furnished with two separate and independent single-pole double-throw contacts for use, for example, on the input and output of a d-c amplifier. **T-11-971**

Gasfluxers

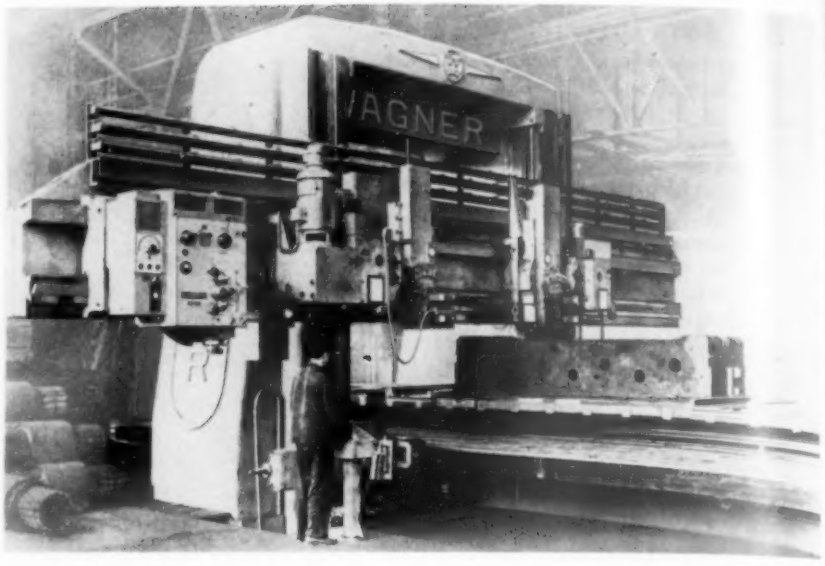
Two new models are announced by the Gasflux Co., Mansfield, Ohio. One of these is the model 68, having a much larger capacity than the model RE. As in the case of the model RE, this unit eliminates the old methods of dipping brazing rod into flux or brushing flux on the work, and makes cleaning operations after brazing unnecessary. The model 68 was designed primarily for use with city gas. It has ½-in. orifices as compared to the ¼-in. orifices of the model RE, and a 3-valve by-pass to regulate the amount of flux that is delivered to the flame. The reserve tank on this model is of one-gallon capacity.

The other addition to the line is the new heavy-duty model SFH Gasfluxer, which has capacity for fluxing 100 to 120 cubic feet of fuel gas per hour and a 5-gallon reserve tank. **T-11-972**

Double Column Planer for Heavy Work

Transverse, vertical, bevel and longitudinal planing operations in the toolroom can all be carried out with a single setup on workpieces as large as 177 in. wide by 110 in. high by 394 in. long through the use of the Wagner double-column planer distributed by Kurt Orban Co., Inc., 205 East 42nd St., New York 17. Other operations possible with the same setup include vertical and bevel slotting, longitudinal and transverse milling.

The adaptability of the Wagner planer to this wide variety of machining operations without realignment of the workpiece reduces the cost of setting up heavy, bulky pieces. This feature is of particular importance in the machining of such pieces as large dies for forming aircraft parts. When these are machined on conventional planers, it is frequently impossible, after planing in one direction, to realign the piece for planing at right angles. On the Wagner planer, the left-hand cross rail head has an infinitely variable drive for feeding it along the cross rail, permitting transverse planing with the original setup with the longitudinal movement immobilized.



For further savings in setting-up time, the table is divided longitudinally into two sections with independent travel. While one piece is being machined on the section of the table under the cross rail, a second piece can be set up on the stationary section of the table.

All motions are push-button controlled from a central point; no levers or handwheels are used. In addition to the central control, provision is made, by patented electromagnetic-mechanical devices, for portable push-button control of horizontal and vertical motions of feed, rapid traverse and precision approach (the last with movements as short as 0.0004 in.). These portable controls permit easy setting from the immediate vicinity of the work. Tool heads on cross rail and on side column have independent power drives. Illuminated windows with arrows, showing direction of feed, permit checking of movements from a distance.

Gear drive for the table has been located to permit heavy ribbing of the bed and columns, resulting in more rigidity at the points of highest stress. Drive location also allows the use of a shorter gear drive, thus eliminating vibration.

Bed ways are ground, after the bed has been set up, by a special Wagner-developed process which gives a guaranteed tolerance of 0.001 inch per 80 feet. This process can be applied by the purchaser of the machine if regrinding should become necessary. T-11-981

Scaler-Printer

A [illegible]-printer designed for radiation [illegible]unting as applied in nuclear work, [illegible]kaging and other applications, has been announced by the Research & Control Instruments Div., North American Philips Co., Inc., 750 South Fulton Avenue, Mount Vernon, N. Y.

The instrument indicates in printed numerals up to 999 and provides for multiplying this figure by 2, 4, 8, 16, 32, and 64. It will resolve pulses separated by 5 microseconds and performs reliably for indefinite periods of time. An interval timer having a range up to 55 seconds allows count accumulation for a predetermined interval, reproducible to within 0.13 second.

An alternative indicator is available on the scaler chassis in the form of three rows of neon lamps in decimal arrangement. This works independently of the printer and can be relied upon separately.

The instrument counts electronically, stores the counts in a memory circuit, and after completion of the counting interval, channels the memorized count into a mechanical printer where part movements are minimized to assure long life. The digit wheels operate independently of one another and no parts move if two consecutive counts are identical. Similarly, suppose the first count is 632 and the second is 635—in such case, the first two wheels remain motionless and the third wheel merely rotates from 2 to 5.

A negative input pulse of about one-volt amplitude is required. About 200,000 such pulses per second can be handled by the circuitry, but actually, with pulses having short rise times of about one or two microseconds, amplitudes as small as 0.1 volt can be counted. Provisions are made for introducing and counting positive pulses where desired, and a 60-cycle sine wave is available internally for checking operation of the instrument.

The timer on the new instrument controls the counting interval and has an eight-rpm synchronous motor driving a planetary gear clutch. The motor runs continuously but the output shaft remains stationary until power is applied to a clutch coil. This drops a pawl onto a ratchet wheel with a differential time element of 0.08 second per tooth. The drive is stepped down resulting in an output speed of one rpm. **T-11-991**

Safety Valve

An automatic gas cut-off valve has been developed by the Kelly Safety Device Co., Cleveland, Ohio.

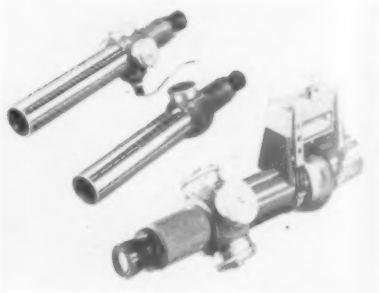
The Kelly-Byrne positive safety valve is designed for use with natural and manufactured gas, and is primarily intended to be placed on a building's gas supply line in front of the gas meter. In event of a fire a fusible link, made of Geon 404 plastic, distorts at approximately 165 deg. F, forcing a tension spring to close the valve. This will prevent the discharge of gas from a melted gas meter.

Valves now in common use must be shut off by hand. This is often impossible to do because of the excessive heat, smoke, and fumes that accompany fire. The Kelly-Byrne valve is an automatic closing valve with ground metal-to-metal seating and proper openings for gas to pass through freely. The valve stem is held in an open position by the plastic link. When excessive heat comes in contact with the plastic, the link spreads, breaks, or becomes elastic enough to allow the stem to spring to its closed position, positively cutting off the flow of gas. Replacement links return the valve to perfect operating condition.

Having Underwriters' Laboratories' approval, the valve's most important part is the plastic link made from Geon 404 rigid unplasticized polyvinyl chloride resin. **T-11-992**

Alignment Telescop

The micro alignment telescope [illegible] now available with built-in auto-refl[illegible]tion unit. This precision instrument [illegible]s a hardened, ground and chromium-[illegible]ated steel barrel of 2¼ in. diameter, [illegible]gnification of 30X and 45X, and b[illegible]t-in optical micrometers to check alig[illegible]ent.



The micro alignment telescope permits not only the checking of point alignment to 0.001 in. accuracy over distances from 18 in. to more than 150 ft, but also the determining of squareness of mirror targets through built-in auto reflection. Since a truly square mirror target returns to the operator an image of the instrument's objective end, a target which is out of square will show this image out of center. The built-in illuminator and specially calibrated graticule permit the operator to exactly determine squareness of the mirror target.

When it is necessary to set the telescope truly horizontal, a stride-level is provided which has precision split-bubble reading now standard in all surveying instruments of high quality.

Where micrometer reading of displacement is not required, the telescope is furnished in a simplified form without built-in optical micrometers. This unit can also be equipped with auto reflection.

For precise point and tilt alignment, an aligning tube is furnished, consisting of a hardened precision ground, and chromium-plated barrel of the same diameter as the telescope, with two built-in targets at 10-inch distance. When both targets appear aligned in the telescope, perfect alignment between telescope and the aligning tube is established. The illuminator for universal use provides even and strain-free light for all targets.

For further information, write to the Engis Equipment Company, 431 South Dearborn St., Chicago 5, Ill.

T-11-1001

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THE TOOL ENGINEER'S *Service Bureau*

TRADE LITERATURE CURRENTLY OFFERED BY THE TOOL ENGINEER ADVERTISERS

LITERATURE NUMBER	COMPANY	BULLETIN	DESCRIPTION
A-11-180-1	Acme Industrial Co.		Bushing selection made easy and speedy. Trouble and time economy explained in free catalog.
A-11-176	Allegheny-Ludlum Steel Corp.		"Blue Sheet" folder gives technical data on B-47 hot work steel—double service, double life.
A-11-240	American Drill Bushing Co.	101	Best quality and service with American drill jig bushings—free catalog.
A-11-123	American Wheelabrator & Equipment Corp.	43	Die finishing and maintenance; tool finishing and deburring; scale removal; all simplified by use of Liquamatic.
A-11-141	Ampco Metal Inc.		It's production-wise to Ampco-ize. Safety, dependability, economy.
A-11-134	Armstrong Bros. Tool Co.		Added profits minus added tool costs with the "Armstrong System."
A-11-131	F. E. Anderson Oil Co.		Free book explains how Lusol cuts metals without smoke, eliminates dermatitis and odor.
A-11-233	The Atrax Co.		Longer service, fewer production difficulties, better profits, assured with Atrax. Complete free catalog.
A-11-202	The Bellows Co.	CL-30	"Controlled-Air-Power" reduces fatigue, makes tough jobs easier, assures product uniformity.
A-11-149	Besly-Welles Corp.		Rework and scrap reduced—no idle machine time with Besly-Bowen grinder.
A-11-200-1	Cadillac Stamp Co.		Perfect alignment, a high degree of hardness with toughness assured with Cadillac marking devices.
A-11-196-2	Chicago Tool & Eng. Co.	10	Circular tells how Rotary, Index, Milling Table turns your drill press into a vertical miller.
A-11-111	The Cleveland Cap Screw Co.		The new Slotted-Type place bolts are economical in cost and use.
A-11-109	The Cleveland Tapping Mach. Co.	T-19	A unique combination in saving valuable working time and cutting production costs.
A-11-232	Colonial Broach Co.		"Broaching News" gives extensive information on company's products.
A-11-227	Davis Boring Tool Co.	DB110	Save time, save money boring with Davis tools.
A-11-112-2	Detroit Stamping Co.		Catalog describes rapid toggle action and easy work removal with De-Sta-Co clamps.
A-11-247	Ex-Cell-O Corp.	25962	Speed, precision endurance with Ex-Cell-O grinding spindle.
A-11-128	The Gairing Tool Corp.		Intelligent use of the All-Purpose holder results in production economy and eliminates tooling problems.
A-11-17	Gisholt Machine Co.		Simplimatic Automatic Lathe catalog describing full information and specifications. Illustrated. Presents job facts.
A-11-20	Gisholt Machine Co.		"Wear and Surface Finish" textbook gives complete story with time-saving ideas.
A-11-198	Grinding Wheel Institute		Standard Sizes and shapes of grinding wheels protect your investment.
A-11-164-3	Grobet File Co. of America, Inc.	HC1	Scientifically designed chatterless countersinks described in catalog.
A-11-116	Hammond Machinery Builders	701	Bulletin offers a fast, economical and accurate means of grinding solid carbide insert tools.
A-11-3	Hardinge Bros.	36	Catalog stresses economy, reduction of tooling costs and step-up production.
A-11-91	The B. Jahn Mfg. Co.		Send for the "Story of B. Jahn Production Proved Dies." Unqualified satisfaction.
A-11-32	Kling Brothers Engineering Works	347	Bulletin lists full technical data and specifications on Kling multi-purpose "jack-of-all-jobs."

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A-11-2	Landis Machine Co.	F-90	Precision and thread finish assured with "Landmatic" Die Head with Taper attachment.
A-11-36	Latrobe Steel Co.		Booklet "Your Tooling and Desegatized Steel" lists the answers to tooling problems.
A-11-243	Lindberg Engineering Co.	1440	Advantages of Lindberg Induction Heating Units given in bulletin.
A-11-237	Meehanite Metal Corp.	35	"Meehanite Castings Serve All Industry" bulletin provides assurance of service and production requirements.
A-11-14	Metal Carbides Corp.	CR-50	The Magic key to improved surface finish, more uniform gage and closer tolerance on all types of cold-rolled metal strip.
A-11-192	Miller Motor	H-104 A-105	Bulletins describe High-pressure hydraulic cylinders.
A-11-127	Newcomer Products, Inc.	108	Catalog lists numerous advantages in use of S-6 Carbide.
A-11-152-1	Oakite Products, Inc.		Free booklet offered "Some Good Things to Know about Metal Cleaning."
A-11-172	OK Tool Co.	13	Complete details of OK Carbide Milling Cutters for milling cast-iron, steel and nonferrous materials given in catalog.
A-11-160-1	Parkwood Laminates, Inc.		Hi-den technical bulletin shows how to reduce tool fabrication time.
A-11-133	Potter & Johnston Co.	145	Bulletin explains how to work out best possible tooling for better quality, lower costs and fewer rejects.
A-11-226-1	J. A. Richards Co.	TE-5	Illustrated folder explains how to produce without special tooling.
A-11-167	Rivett Lathe & Grinder Inc.		Catalogs tell how Rivett furnishes a complete package of air and hydraulic power.
A-11-190	Robertson Mfg. Co.		"How to Buy Production Time" booklet tells how to meet any grinding operation problem.
A-11-13	Scully-Jones & Co.	600	New "JT" floating tap holder helps solve your tooling and production problems.
A-11-125	The Skinner Chuck Co.		Catalog explains why strength, rigidity and design features are essential for today's production needs.
A-11-144	Standard Pressed Steel Co.		"Unbrako Standards" lists advantageous features of Unbrako square head set screws.
A-11-146-3	P. A. Startevant Co.		Valuable data offered on torque wrenches—accurate, fast, indestructible.
A-11-25	Sundstrand Machine Tool Co.	725	Bulletin explains modern production features of Sundstrand lathes.
A-11-226-2	Torit Mfg. Co.		Torit Dust Separator designed to fit into present or future production layouts.
A-11-206	Turchan Follower Machine Co.		New catalog tells how to get more and better work in milling, turning and planing.
A-11-189	U. S. Tool Co., Inc.	80E	Have you a press feed problem? Read bulletin on U. S. Automatic Press Room Equipment.
A-11-113	Vlier Mfg. Co.	53	No idle machines with Vlier fixture keys—inexpensive time savers.
A-11-146-1	The V & O Press Co.		300% more production per press with V & O Dial Feed. Descriptive catalogs.
A-11-99	Vulcan Tool Co.		"Salvage Industrial Diamonds for Defense." NPA booklet describes critical shortage of diamond supplies.
A-11-197	Wesson Co.	521	Simplicity, indestructibility tested and proven on production lines.
A-11-130	Zagar Tool, Inc.	E-11	Versatility, interchangeability, simplicity of design all stressed in Zagar drilling machines.

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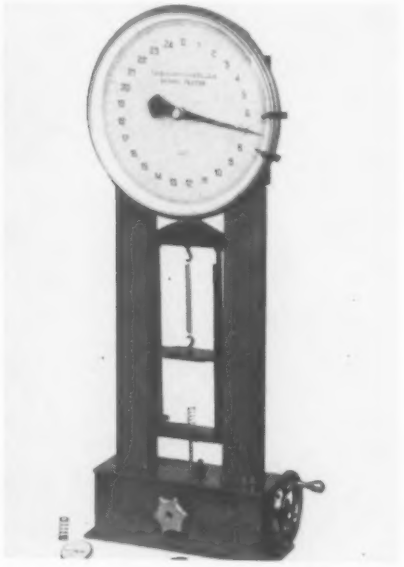
Spring Tester

Loads and deflections of small compression and extension springs are accurately measured by this precision spring tester having a load range capacity from ½ oz to 25 lbs. The scale is accurate to within ¼ of 1 percent, meeting the requirements of the National Bureau of Standards. Steel rules measure lengths in 32nds and 64ths on one side and in decimals in 10ths and 100ths on



the reverse side. A one in. capacity dial indicator measuring lengths and deflections to 0.001 in. is available. It is adaptable for both general purpose and high quantity production testing, and the speed of testing varies from 250 to 500 tests per hour. Production stops and tolerance markers are easily adjustable. Springs with diameters up to 2 in. and lengths up to 10 in. can be tested. Made by The Carlson Co., 277 Broadway, New York 7. **T-11-1031**

Soft Metal Cleaner

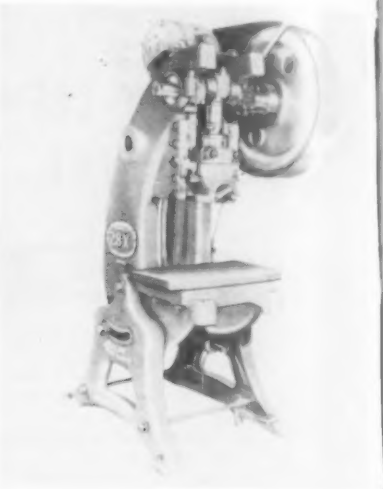
The development of Oakite composition No. 80-A, a material designed for use wherever an excellent cleaner offering a high degree of safety to aluminum, tin or other soft metals is required has been announced.

Composition No. 80-A, the manufacturers state, has applications for a variety of work in aircraft and metal plants where exceptional cleaning ability and thorough safety in use are essential. Material may be used in soak tanks or pressure spray washing machines, is readily soluble in hot water, rinses easily with hot or cold water. It does not exhibit any tendency to foam excessively, it is claimed.

Additional information regarding this material may be obtained by writing to Oakite Products, Inc., 158 Rector Street, New York 6. **T-11-1032**

Deep Throat Press

Suited for production, toolroom or test runs, this press features precision ground parts balanced and surface finished to Brush analyzer standards. Carefully ground forged steel crankshaft, hand scraped bearings, solid web wheel and gears allow smooth, high speed operation.



Model 28X is readily inclinable, locks positively in any position. A simple two-button safety device is provided for operator protection. Complete information can be obtained from Walsh Press & Die Co., 4709 W. Kinzie St., Chicago 44. **T-11-1041**

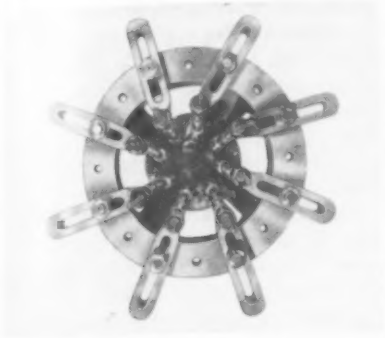
Surface Grinder

For production grinding of solid carbide blanks, this surface grinder produces a finish of 1 to 2.5 rms and gage block flatness, using a 150-grit diamond wheel. It holds dimensions to ±0.0002. Due to a patented process, the wheel can be dressed and trued to 0.0005 in. in a few minutes. Longer wheel life is assured, reducing diamond cost from

20 to 50 percent per unit. Diamond salvage is less than one carat per lb of sludge. The simplified operation eliminates complicated controls and specially skilled labor. Made by Spike Mfg. Co., 24609 Middlebelt Rd., Farmington, Mich. **T-11-1042**

...int Drilling Head

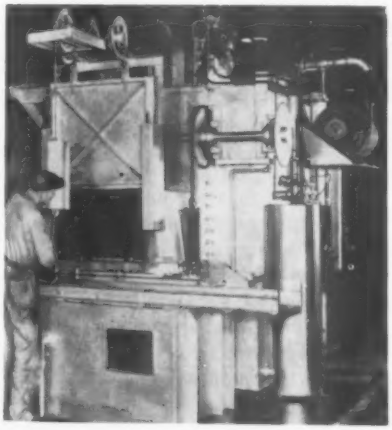
E... ...gton Mechanical Laboratory, Inc., ...ten Island 4, announces the introd... ...on of the universal joint drilling head. This tool is adjustable to any



pattern of holes and is available with 4 to 12 spindles. The head features all aluminum housing construction, thrust bearings and gears turned on spindles. The universal joint drilling head is available in two sizes: No. 0—0 to ¼ in. full range of collets furnished; No. 1—⅜ to ½ in. No. 1 Morse taper socket or chucks for straight shank drills. **T-11-1051**

Batch Furnace

A batch furnace, capable of case and homogeneous carburizing, dry cyaniding, clean hardening and carbon restoration at high production rates is available



in two capacities, 500 and 1600 lb per hr gross. This furnace embodies the versatility and economy of the standard type heat-treat furnace with the high production rates inherent in specialized units.

The operating temperature range is 1450-1750 deg F, utilizing radiant tube heating elements and a forced convection recirculating fan. A special enclosed quench chamber permits rapid direct quench under controlled atmosphere conditions. Made by **Surface Combustion Corp.**, Toledo, Ohio. **T-11-1052**

Centerless Grinde

Crush dressing of grinding wheels to establish special profile shapes possesses certain advantages over more conventional diamond dressing. The Diversimatic is one of the first tools of its kind to utilize this process and now permits profile grinding on centerless machines. The application is made possible only by the rigid, deflection-free support resulting from an antifriction spindle bearing design.

Crush dressing utilizes a precision ground roll of desired profile which is crushed against and imparts its shape to the grinding wheel. Speed of the latter is greatly reduced during the dressing operation. With this process the Diversimatic gives a better method of producing many precision parts. Where finish is important, complicated profiles can be rough turned on screw machines and centerless ground over their entire surface at high speed. The process also establishes tolerances impossible to obtain by turning.

Production of small parts, particularly those used in business machines, has always presented two problems. First is the necessity of tolerance; second is wear resistance. Tolerances could be obtained on precision machines but wear resistance was something else. Heat treatment was impractical due to resulting warpage. With profile grinding now possible on the Diversimatic, heat treatment of small parts can be utilized. Warpage is automatically removed from the tiny hardened parts by the centerless operation. Tolerances held are extremely close.

Where the difference of diameters on profiled shapes is relatively small, many parts can now be ground direct from the solid with no roughing operation required.

The crush dressing unit on the Diversimatic consists of a rigid, substantial cast iron harp which mounts on top of the main spindle housing. This harp supports a vertical, dovetailed column which is equipped with a sliding knee. The removable crush dressing roll and drive mechanism is mounted in the knee which may be lowered to contact the entire wheel face. The complete sliding assembly is counterbalanced and equipped with two manual controls, one for raising and lowering rapidly, the other for micrometer feed into the wheel.

This unit is engineered for the Diversimatic centerless grinder and cannot be adapted to others. Made by Diversified Metal Products Co., 5125 Alcoa Avenue, Los Angeles 58.

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Dial Rivet Setter

This dial fixture automatic rivet setting equipment, model 4012 is designed to provide greater speed of tubular riveting through simplification of loading and control of operator speed, and also to eliminate safety hazard in the riveting of small or awkward parts. Combining a 40 in. diameter rotating dial fixture equipped with 12 fixture stations, this unit feeds and clinches three tubular rivets simultaneously through the one single setting and two double setting automatic rivet setters. The elements are of their standard design, though the combination is built to order to suit the particular item being riveted. The individual station fixtures include special clamping fingers that automatically close after the loading position and open after the final riveting position.

The fixture and riveting machines are intended for continuous operation, but an operator-controlled foot switch will immediately stop the riveting if an error in loading must be corrected.

The dial fixture is driven by a Geneva gear-type mechanism actuated through a Graham transmission that permits control of rotation rate from 0 to 35 stations per minute. Stations are positioned with a positive stop and riveting machines are tripped by solenoids operated by a precision switch.

For information, write to Chicago Rivet & Machine Co., 9600 West Jackson Blvd., Bellwood, Ill. **T-11-1071**

Power Hack Saw

A larger model Keller power hack saw has been announced by Sales Service Machine Tool Co., 2363 University Avenue, St. Paul, Minn.

The model known as the No. 5 Hyduty Keller power hack saw has capacity for a 9¼-in. round or an 8x9-in. flat.

It is provided with cabinet base, automatic lift on the reverse stroke, and a foot lever to help hold the frame in

position while loading or unloading the saw or setting the saw for desired material length. Variable power pressure regulator to the blade by an easy operating control wheel at the front of the saw provides pressure from 0 to 200 lb. This enables the saw to cut any material from the lightest wall tubing to heavy shafting with greater speed and efficiency, according to claims of the manufacturer.

The saw is equipped with a swivel base vise with quick adjustable sliding jaws and single screw. Guide bars on the frames are brass ways on a heat-treated steel guide bar and are readily adjustable for wear. All bearings have oilite bushings. The coolant pump is the original Keller pump.

Standard equipment includes an automatic stop switch, hinged motor bracket for automatic take-up of belt and quick changing of saw speed and one-hp motor. **T-11-1072**

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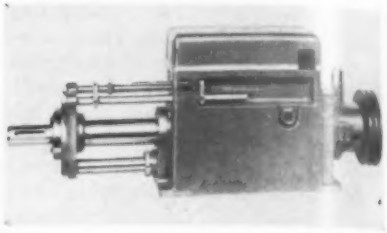
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-11-107

Drilling Attachment

The Drill unit is a small self-contained unit which can be mounted on a machine in any position for ex a drilling and boring jobs. It weigh 175 lbs and has few parts. The spindle direct driven by an electric motor; ntrol is by push-button; traverse rate is over



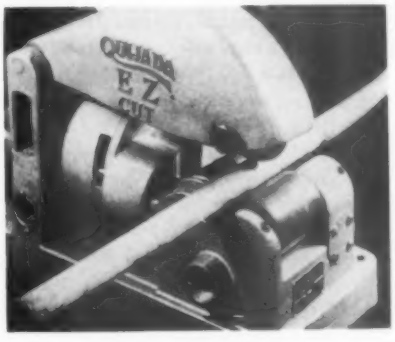
400 in. per minute, feed rate up to 30 in. per minute; capacity ½ in. in steel. Speeds can be varied by changing sheaves and belts. Multiple heads can be mounted to the flange of the quill. It is a production tool especially adapted for use on transfer machines. **Drill-unit, Inc.**, 637 Mt. Elliott, Detroit 7.

T-11-1081

Pipe Cutter

A portable pipe, tube and conduit cutter, named the E-Z cutter, features power-driven roller.

Suitable for on-the-job cutting in both large and small shops, the E-Z cutter's power-driven rollers revolve around the pipe; hence, cutting is continuous, slippage is eliminated and the heat-treated, high-speed tool steel cutter wheel does not wear in one spot.



The cutter will handle pipe from ⅜ in. to two inches and tubing from ⅝ in. to three inches. Adjustable roller type pipe supports allow any length and size of pipe to be cut without changing the supports. A foot control switch leaves the operator's hands free to handle work. In production runs, the cutter has attained cutting speeds of 10 seconds for two-inch pipe and six seconds for three-inch tubing.

Further information may be obtained from Quijada Tool Div., Gaines-Collins, 5474 Alhambra Avenue, Los Angeles 32.

T-11-1082

Truck-Drain Rack

A combination truck and drain rack that is designed for industrial users of soluble oils, cutting oils and detergents, is being manufactured by Palmer-Shile Co., 1321 Mansfield, Detroit 27. It can be easily moved through crowded, narrow aisles and around heavy machinery.

To load, the truck is tilted against drum, sliding steel fingers down to engage top rim of drum; then truck is rocked back to wheeling position, and loading is automatic. A slight downward push on the truck handles raises the wheels and lays the rack on the floor, thus providing convenient drainage of the drum. It is equipped with detachable handles that may be removed to conserve floor space; one pair will serve any number of trucks.

Of welded construction of heavy angle iron frame with sturdy steel tubing for handles, the truck has two eight-inch roller bearing wheels. Weight is approximately 90 lb. **T-11-1091**

Miniature Clutch

A line of miniature over running clutches known as Miniclutch has been perfected by High Precision Inc., 375 Morse Street, Hamden, Conn.

Typical applications are recording instruments and business machines, motion picture projectors, sewing machines, automatic vending machines, ratchet-feeds, servo mechanisms, lubricant pumps, and control devices such as are used in gun-pointing equipment.

This free-wheeling one-way miniature clutch, which has four rollers, features instantaneous smooth action, is inexpensive to produce, and stands up under long and continuous use. Tests on a unit measuring only ¾ in. in diameter used as a variable stroke ratchet showed the ability to throttle down to a feed of less than 1/300th of a revolution per stroke.

While the manufacturers specialize in the hub and roller assembly, they are prepared to supply the outer housing and shaft to comform to specifications of individual products. **T-11-1092**

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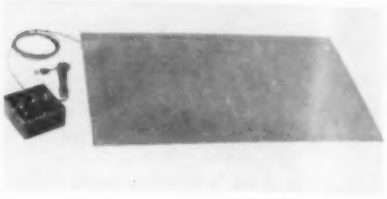
Mat Switches

The Recora Co., 7419 S. [illegible]estern Ave., Chicago 36, announces a line of Switchmats—extended area electrical switches in the form of sheets or thin mats. Available in any size or shape from 2x2 in. to 36x144 in., the SPST switches are actuated by predetermined pressures ranging from a few ounces to several tons. Only 3/16 in. thick, they can be used on floors, platforms, stair treads, etc., without obstructing foot or vehicle traffic. Foot pressure on any



part of the area covered by the mat closes the circuit; release of pressure instantly opens it. Mats are hermetically sealed against moisture and weather between vinyl, rubber or neoprene. Switch mats can handle up to one ampere at 110 volts directly, and can control the operation of high voltage, high current devices when used in conjunction with the control boxes also manufactured by The Recora Co. Available controls cover types for temporary and permanent installation and provide instantaneous and delayed action. Typical uses are as foot switches for various industrial and commercial electrical equipment; actuators for automatic door operators; interplant traffic controls; safety and production devices for machine operators; entry alarms; automatic lighting of yards, signs, and advertising displays; and for many other factory, institution, commercial and life-saving applications.

T-11-1101

Conveyor Belt

A new type of conveyor belt that is virtually rip-proof has been placed on the market by New York Belting & Packing Co., Passaic, N. J. It is designed particularly for use where conveyor belts may be subject to severe ripping or tearing action by foreign objects, such as in coal mining and handling, quarry work, and mining of metallic ores.

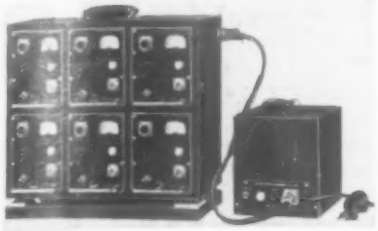
The outstanding feature of these belts is the special carcass which has multiple strands of high tensile steel wires imbedded at three-foot intervals. Even in the rare instances where a foreign object punctures the belt, the tearing is limited by the construction to a maximum of about three feet lengthwise.

This product is suitable where conveyor belts are subject to tears and punctures as well as abrasive action.

T-11-1102

Amplifier Unit

The Model 201-A six-channel amplifier unit is a portable (69 pounds complete with power supply), self-contained system used primarily for the accurate measurement of such physical phenomena as strain, pressure, acceleration, vibratory displacement, and velocity.



The unit consists of six individually excited, three-stage, single-channel amplifiers, with output metering and overload indicating circuits and with linear and integrated amplification employed to provide for the use of a wide variety of pickup devices; a separate electronically regulated power supply providing both a-c and d-c power to all channels; a shock-mounted cabinet with power plugs for inserting the single-channel amplifier units and the necessary power and test cable assemblies.

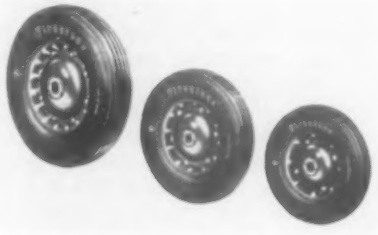
Recording of the amplifier output is usually accomplished by a recording oscillograph such as the Hathaway SC-16A, a tape recording device, or similar recording instruments.

For further information write to the **Yellow Springs Instrument Co.**, Inc., P. O. Box 106, Yellow Springs, Ohio.

T-11-1111

Industrial Wheels

A line of pressed steel wheels for industrial applications is available. These wheels, equipped with semi-pneumatic, pneumatic or solid tires, carry tire load ratings to 300 pounds. Wheel sizes are 6 to 14 in. and are available with ball bearings or oil retention type bearings.



The wheels are constructed of pressed steel and are designed for ease of operation with the maximum of strength. Tires will not creep on the wheels, insuring positive traction. They are available with spray-baked enamel finish to customers' color specifications.

For additional information, write to Indus Corp., 431 North Holmes, Indianapolis 22, Ind. **T-11-1112**

Two Lift Trucks

Two fork lift truck models have been released to industry, according to an announcement of the Hyster Co., Portland, Ore., Peoria and Danville, Ill. They are an 8,000-lb. capacity truck and a 6,000-lb capacity model. Both are gasoline-engine powered and mounted on pneumatic tires. Both in design and mechanical features, the trucks are refinements of the very latest in lift truck research and engineering.

Designed as an outside truck, the ZA-80 is the first heavy-duty 8,000-lb industrial truck of its kind that can be operated efficiently indoors as well as out. Special attention was given to operator comfort, ease of daily servicing and safety. Other outstanding features are shorter overall length, longer wheelbase and better weight distribution than usually found in a truck of this size.

The XA-60 model is a 6,000-lb capacity version of the ZA-80, incorporating all the rugged heavy-duty features of the larger truck, but with shorter wheelbase, width and overall length. The smallest and heaviest 6,000-lb capacity truck ever designed, the XA-60 is distinguished by its compactness, maneuverability and versatility on the job.

Among the many mechanical features of both trucks are a long-life clutch that can be completely removed or installed in less than an hour, and large heavy-duty disc-type industrial brakes that eliminate many service and maintenance problems. In addition, both use powerful industrial engines designed especially for the grueling work lift trucks are subjected to. **T-11-1121**

Vinylite Tarpaulins

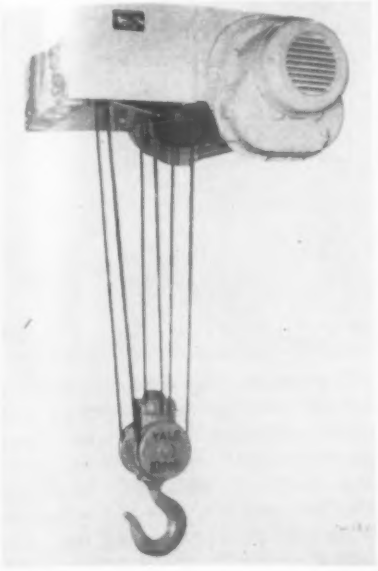
Made of DuPont 10-gage Vinylite, these tarpaulins are half the weight of duck tarpaulins and cost half as much, yet they are more durable and tough. They are 100 percent waterproof, crackproof, peelproof; resistant to abrasion, motor oils and most chemicals; and will not warp or shrink after prolonged weathering and exposure to wide temperature fluctuations. Non-inflammable, they are excellent for protecting machinery, trucks, boats, passenger cars and general cover-all purposes. These tarpaulins protect widely varied sizes and shapes of industrial equipment during shipment and while stored out-of-doors. They replace canvas tarpaulins, wooden boxes and crates.

The Vinylite used is long wearing and tough yet flexible and light in weight; its tensile strength is 200 lb; it comes in sun-proof opaque navy blue. Grommets are inserted at three-ft intervals.

For further information write the American Agency, 799 Broadway, New York 3, N. Y. **T-11-1122**

Bridge Crane Hoist

New deck-type Cable King electric hoists, designed for top mounting in double girder bridge cranes, are available from The Yale & Towne Mfg. Co., Philadelphia 15.



The units, available in capacities of from 1 to 15 tons, feature compactness of design; triple-reduction, spur-geared drive; totally-enclosed, fan-cooled motor; rugged heavy steel suspension frame; and pushbutton-operated heavy-duty contractor.

For safety, the hoists are equipped with two brakes, a Weston-type friction brake in the gear train, and a solenoid-operated contracting drum-type motor brake.

The control station can be mounted in the crane cab or remotely located. Controls for operation of the trolley and bridge also are available. **T-11-1131**

Wire Cup Brush

A wire cup brush with replaceable filler has been developed by Hewitt-Robins Inc., Buffalo 5, for the removal of rust, scale, paint and welding slag from railroad equipment, tanks, gears and other metal surfaces.

The brush consists of inner and outer metal adapters with a replaceable cup-shaped filler in which the wire bristles are anchored in place with rubber. The brush is expected to be more economical because the metal adapters need be purchased only once. The cup-shaped filler can be replaced any number of times. The brush also features improved balance, shock absorption and bristle retention. It will be available in wire gages ranging from 0.014 to 0.028 in. **T-11-1132**

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Stop-Countersink

A micrometer stop-countersink with a non-rotating head and positive-lock adjustment is now available from the Severance Tool Co., 728 Iowa Street, Saginaw, Mich. Adjustment is in 1/1000-in. increments making it possible to achieve precision countersinking in a most easy manner.

The non-rotating feature of the stop unit should speed production in most every application, inasmuch as it is no longer necessary to hold the stop unit from revolving with one's free hand. Also new is the way in which the unit is fastened to the operating gun. This method gives the gun a shorter overall length, bringing overhang down to a minimum and making it possible to work in closer quarters. Another feature worth noting is the full range adjustment of the cutter from zero to maximum countersinking depth. **T-11-1141**

Teflon Paint

Teflon polytetrafluoroethylene produces a finish to which practically nothing will stick. Engineers, particularly in the packaging industry or wherever adhesives are used, have long been occupied with the problem of glue sticking to machine parts, preventing accurate and efficient operation.

A similar headache exists elsewhere in industry where sticky substances such as powdered soap, rubber, candy, and frozen foods are apt to cling to the smoothest metal surfaces. Teflon finishes seem to be the cure to these costly troubles.

The finish is a water suspension of a Du Pont-invented plastic which has such a high chemical, heat, and moisture resistance it is also used to prevent corrosion of equipment and as electrical wire insulation.

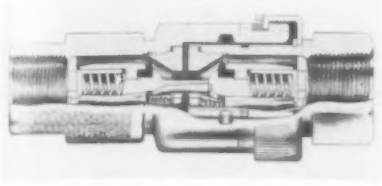
It is an inherently expensive material to produce and will probably never reach a price level that would qualify it as a consumer product. Moreover, the finish must be fused at about 750 degrees F in special equipment.

T-11-1142

USE READER SERVICE CARD ON PAGE 101 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Valved Coupler

A make and break double shut-off valved coupler has been designed and introduced by Henry Valve Co., 3215 North Avenue, Melrose Park, Illinois. Built originally for either ammonia or Freon refrigerants in connection with refrigerated trucks, the coupler also has wide industrial applications wherever pneumatic or hydraulic lines are involved.

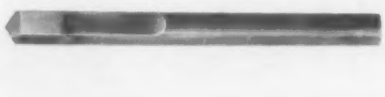


As the two halves of the unit are coupled together, the two piston valves open by moving away from their respective seats. A soft molded insert, mechanically held in place, forms the seat in each half of the coupler. True alignment of pistons is insured by long guides. Pistons can be readily replaced after long service, if necessary, by unscrewing the seat bushings. An O ring in the socket half provides positive seal while the coupling is connected. Protector caps are provided for covering coupler halves when disconnected. Available in ½-in. F.P.T. connections.

T-11-1151

Carbide-Tipped Drills

A carbide-tipped hard steel drill is now made by the Nelco Tool Co., Inc., Manchester, Conn. Designed to meet exacting standards of accuracy, durability and economy, this Nelco drill features a solid carbide slug which is sandwich-brazed to an alloy steel shank.



By a unique brazing process, Nelco bonds carbide to steel in a V notch to assure exceptional torque strength when drilling heat-treated steel. The torque of driving is not dependent upon the braze, but on the way the carbide is held by the shank. When used on heat-treated steel, this Nelco drill in no way anneals the material. A pulverized chip is formed which the drill readily expels from the hole. The flute length is designed for average depth holes, but may easily be altered to drill deeper cavities. These drills are carried in stock and range from ⅛ to ½ in. in diameter in increments of 1/32 in.

T-11-1152

Pressure Tester

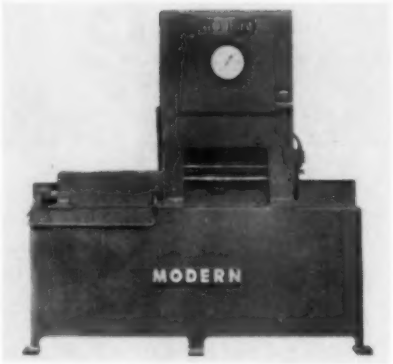
An automatic conveyerized pressure testing machine that checks water jacket areas in automotive engine cast iron cylinder heads for leaks is announced by Modern Industrial Engineering Co., 14230 Birwood, Detroit 4.

In operation, heads are delivered to a transfer station on the machine from the conveyer line. A cycle start button is then energized which causes a hydraulic cylinder to transfer the head to the test station.

In the test station the water jacket areas in the head are automatically sealed in three planes by rubber-faced hydraulically-operated sealing pads.

When the sealing pads contact the cylinder head, the resulting pressure buildup in the hydraulic circuit causes the air test cycle to start.

The head is then charged with a specific volume of air that is trapped in the jacket areas. Pressure loss over a specified test time determines the condition of the casting. A red light indicates parts that do not pass the test. A green light indicates satisfactory parts which are automatically stamped OK by a solenoid-operated marking device.

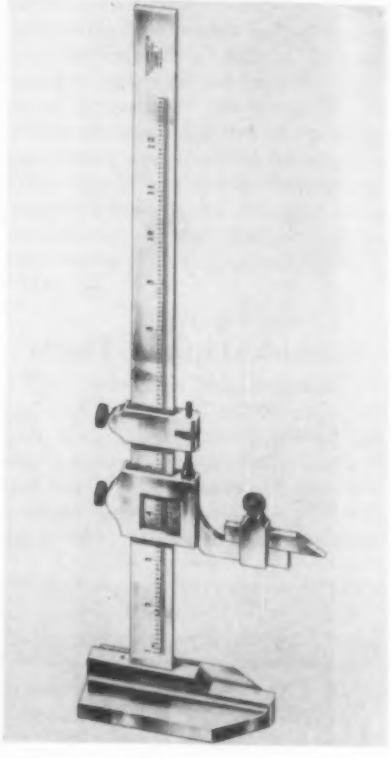


During the test,, the transfer cylinder returns to reloading position. When the test is completed, a cylinder is fed to transfer position, which causes the tested cylinder to be ejected from the machine onto the conveyer line. The machine is powered by a hydraulic pump driven by a three-hp motor.

T-11-1161

Vernier Height Gage

The L. S. Starrett Co., Athol, Mass., has announced an addition of a 12-in gage to their line of No. 454 vernier height gages. Toolmakers, inspectors and layout men will find this gage especially useful because the bar has a 13-in scale which permits taking accurate measurements over a full 12-in. range in thousandths of an inch. (A vernier gage with only 12-in of graduated scale cannot be read with accuracy beyond 11 in.)



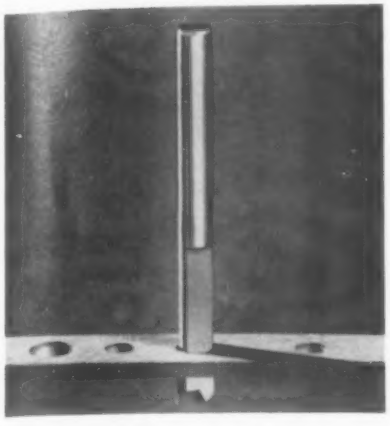
This gage is made of fine steel throughout with a fine ground finish on all surfaces. The bottom of the base and the scriber are hardened and lapped and the bar is hardened with machine-divided graduations. The scriber is easily removable for sharpening or for substituting attachments or a dial indicator. The vernier plate is adjustable to maintain the zero point in the event of wear.

T-11-1162

Carbide Drills

Carbide drills are now available which are carried in stock by Super Tool Co., 2165 Hoover Road, Detroit 13, in an increased range of standard sizes.

There are now 11 sizes stocked: 1/8 to 1/2 in. in the standard round shank style (solid carbide end) and 10 sizes: 5/16 to 3/4 in. in hex shank (carbide tipped) style.



In drilling of tools, dies, fixtures, etc. that require corrections after hardening, these drills with their special grinds have demonstrated big increases in efficiency and up to 200 percent greater strength than conventional type hard steel drills.

One of the features of the design is the long carbide end which tends to dissipate the heat developed at the cutting end as it approaches the point of braze and lessen danger of braze failure.

T-11-1171

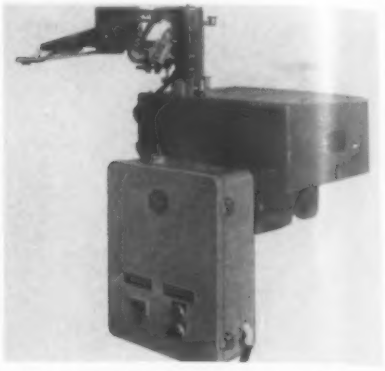
Paper Tubing

Square, rectangular and radiused paper tubes ranging in size up to 9 in. on either side and round tubes up to 9 in. inner diameter are now available. Offered in addition to the company's regular line of tubing, they are designed for use in large power transformers and similar large coil applications, such as in X-ray and diathermic equipment, etc.

Tubes are spirally-wound of dielectric kraft, fish paper, cellulose acetate or combinations, to lengths as specified. Since they are produced on adjustable mandrels, any size from fractional-inch to maximum dimension can be furnished without extra tooling charge. Acetate overwrap on kraft and fish paper tubes, varnish dip, or resinite impregnation can be had for special applications where increased dielectric properties and unusually high resistance to moisture and corrosion are essential. For further information write to Precision Paper Tube Co., 2035 West Charleston St., Chicago 47. **T-11-1172**

Punch Press Feeder

A redesigned version of its mechanical punch press feeder has been developed by The V & O Press Co., Div. of Emhart Mfg. Co., Hudson, N. Y. The new model was designed to broaden the application of the unit in secondary die work and to permit its use for parts transfer operations not connected with punch presses.



Designated Feed-O-Matic F-3, the new model is equipped so that the pick-up can be timed to coincide with the completion of a production operation or with the arrival of the part at a predetermined location. Or in the case of a press installation the timing of the press stroke is controlled by the Feed-O-Matic unit.

The operator places the part into a nest, and a transfer arm picks the part out of the nest and places it into the die. The operator's hands or arms are never in a danger zone, a safety factor that, according to the manufacturer contributes to higher productivity.

The F-3 will provide direct vacuum pickup for flat parts, vacuum controlled grip fingers for pieces that have different planes and in special applications a magnetic pickup. **T-11-1181**

Band Saw

A new band saw manufactured by W. F. Wells and Sons, Three Rivers, Mich., is called model J-24. It has an extra large capacity 24x24 in., making it suitable for both large and small cutting jobs.

A special arrangement of the cutting head employing two wheels rather than a single large one on each side holds over-all size of the unit to just a trifle more than smaller capacity saws.

The model J-24 also features full and semi automatic operation (cutting head raises and lowers hydraulically). It is sturdy, all welded, rather than of bolted construction and has longer blade life.

T-11-1182

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Portable Nibbler

A portable nibbler that cuts through 14-gage stainless steel, CR steel, galvanized iron, and softer materials in proportion, without distortion on either side has been developed by Fenway Machine Sales Co. Inc., 20 South 15th Street, Philadelphia 2. The Little Wonder nibbler also cuts holes in tubes and

ducts without damaging in any way the original contour. This nibbler is extremely accurate, and can be used as a hand tool or easily mounted in a vise for bench operations. Minimum cutting radius is $\frac{7}{8}$ in.

In a rugged aluminum casting, the Little Wonder nibbler weighs $7\frac{1}{2}$ pounds. It is 10 in. long, comes equipped with a Universal motor, 3 conductor, 8-foot rubber cord and connections. Antifriction bearings are on all rotating parts. Gears are precision hardened. It is guaranteed against defects in materials or workmanship. **T-11-1191**

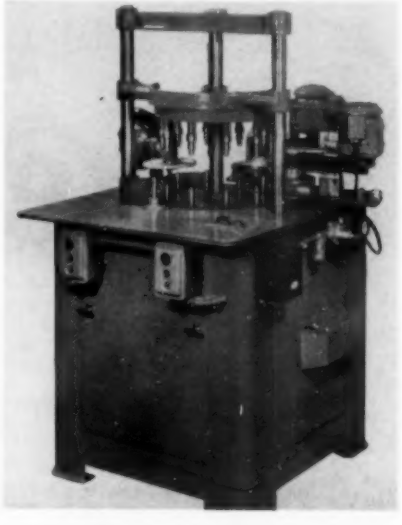
Floor Patch

A high-speed method to repair holes, ruts and other imperfections in concrete floors of all kinds is announced by United Laboratories, Inc. 16801 Euclid Avenue, Cleveland 12. This product, known as Superset Tampatch, is applicable throughout industry and institutions wherever the need lies to repair floors without loss of productive time. Essentially, all that is needed is to clean and bond the surface to be patched, dump in the required material and tamp firmly into place. The patched area may be placed in service almost instantly. The patch becomes smooth with moving traffic and will withstand heavy loads. Superset Tampatch is composed of specially prepared aggregates coated with fast drying synthetic resins and combined with asphaltic oils. The material is shipped in drums of various sizes, ready to use without mixing. When the container is kept airtight, the material will keep indefinitely and is ready for use at any time. The bonding material is delivered separately and is also available in various size containers. **T-11-1192**

Flash Lathe

Production of a ten-spindle automatic flash lathe, with intermittent motion on the turret, is announced by the J. M. Nash Co., 2360 North 30th St., Milwaukee 45. Originally designed for the plastic industry to handle various finishing operations on circular plastic moldings, parting line flash removal, gate trimming, grooving, abrading, polishing, buffing, etc., the designers state that the machine is equally useful in the metal trades industry. It is particularly adapted for secondary operations on small circular metal parts, flash trimming of die castings, finishing of electrical parts, deburring, besides a varied number of finishing operations on circular parts.

Known as the Nash No. 103-B automatic flash lathe, the machine consists of a ten-spindle rotary table, the spindles having a variable rate of rpm from 700 to 2000 revolutions. The top wheel is adjustable up and down, and spindles of this top wheel retract for work ejection and piece loading. The top cam allows spindles to lower and hold work securely directly after loading, and locates it for finishing operations at various work stations. If necessary, bottom spindles can be provided with collets, eliminating top pressure spindle assembly.

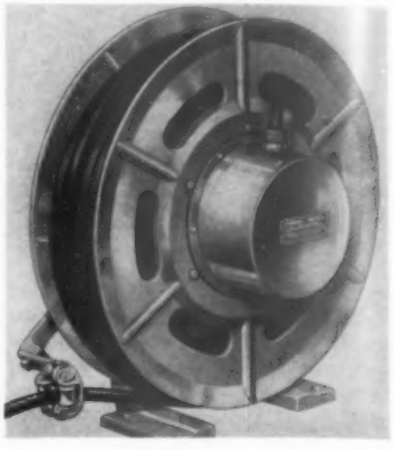


The ten-station index is air-powered, hydraulically checked and electrically controlled. Other features of the machine include full control on rate of index, gradual approach to tooling, and metered time at stop position.

The new lathe has continuous automatic cycling, and the production rate is determined by the operations performed. A variety of tooling can be mounted on the back table, permitting use of a 140-deg tooling arc for tool arrangement. Tooling supplied by the manufacturer consists of motor-driven buffing wheels, motor-driven abrasive or buffing belt units, carbide file finishing units, micrometer adjustable centers, crimping rolls, revolving knives for height trimming, grooving knives, grinding wheels. It is possible for the user of the machine to develop any type of tooling to handle his finishing problem.

T-11-1201

Cable Reel



Spring-O-Matic Powereel, an improved spring retractable reel for electric cable, has been placed on the market. The product is designed for greater adaptability to all applications and is made lightweight yet durable through the use of cast aluminum wherever possible.

A feature of the reel is a ratchet which functions perfectly in any of four positions. This means the reel may be mounted on the floor, ceiling or right or left wall. This ratchet is optional and can be locked in or out of functioning position.

Another factor which increases the adaptability of the reel to different job situations is an adjustable cable guide. The guide can be moved to any desired position on the circumference of the reel, permitting pull-down, pull-up or pull-out unwinding.

With the mounting bracket located well under the reel and less than its width, the reel requires a minimum of mounting space.

The unit is ball-bearing mounted throughout. A gasket-sealed housing protects the important collector ring against dust and moisture.

For further information write Industrial Electrical Works, Dept. 129a, 1505 Chicago Street, Omaha 2, Neb.

T-11-1202

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North East West South IN INDUSTRY

Irving **Woolson** is the new president of **Desota** Div. of **Chrysler Corp.**, succeeding the late C. E. Bleicher. Mr. Woolson, who has been the vice-president in charge of manufacturing and a member of the board of directors, has been with Chrsyler for the past 24 years and with Desoto since 1926. Among his earliest assignments as a draftsman with the company, was work on the first DeSoto engine. During the past two years he has been responsible for installing tools and equipment and getting production under way at DeSoto's new body and engine plants.

Harry C. Martin, director of research and development of **The Carborundum Co.,** has been elected a vice-president of the company. Mr. Martin will continue active direction of research and development activities and will serve as principal advisor to the president on all technical matters. Mr. Martin joined Carborundum's research laboratory in 1913.

H. C. MARTIN

W. L. SMITH

Walter L. Smith has been elected vice-president in charge of operations and director of **Chase Brass & Copper Co., Inc.** Mr. Smith, who joined the company in 1915, has served as works manager of the Chase Metal Works for the past six years.

Wilbur Gardner, secretary and treasurer of **DeWalt Inc.** has been elected a vice-president of the power cutting tool manufacturing subsidiary of **American Machine & Foundry Co.** Mr. Gardner, who has been associated with DeWalt since 1925, will continue in his former capacities.

Merle E. Kremer has been made assistant to the president of **Allied Products Corp.** For the past eleven years, Mr. Kremer has been associated with General Electric.

At the same time, Frank H. Bishop, president of Allied Products named **Wynne R. Lilly,** formerly with Dura Corp., supervisor of new products development.

Henry J. Fischbeck, a specialist in the field of metallurgy for more than 35 years, has been appointed staff metallurgist in the advanced tool engineering group at **Pratt & Whitney Aircraft,** division of **United Aircraft Corp.**

In his new position, Mr. Fischbeck will work on metallurgical problems involved in planning production methods and tooling for advanced turbine engines now in developmental stages.

At the same time, **Spencer W. Deming,** assistant supervisor since 1945, was named to succeed Mr. Fischbeck as supervisor of metallurgical and chemical processing.

Several promotions, recently announced by **Snyder Tool & Engineering Co.** and its subsidiary, **Arthur Colton Co.,** included the naming of **Bruce M. Regan** as manufacturing manager of all Snyder and Colton plants. He previously was general superintendent of plants.

At the same time **George Derwich,** who joined Snyder in 1925, assumed responsibilities of plant superintendent of plants No. 1 and 2. Succeeding Mr. Derwich as assistant plant superintendent, is **Robert J. Maxvill,** who since 1947 has been foreman of the assembly department.

Robert L. Hold is the new vice-president of **Bowser, Inc.** Mr. Hold has been on the company's board of directors for the past two and one-half years and on the finance committee for the past year and one-half. In addition to his position with Bowser, he will continue as vice-president and director of the Pacific and Atlantic Shippers Association, and as a director of the Missouri Edison Co.

In an announcement by **Bowser Technical Refrigeration**, a division of Bowser, Inc., **Jack Shamroth** was named vice-president in charge of manufacturing and engineering. Mr. Shamroth, who has been associated with the company for the past nine years, formerly was in charge of production.

At the same time, **Thaddeus Augustyn** was made production manager and a member of the management committee. Mr. Augustyn has served as coordinating engineer and chief draftsman with Bowser since 1946.

At the October meeting of the board of directors for **Allis-Chalmers Manufacturing Co., J. D. Greensward** was named vice-president and director of manufacturing of the general machinery division. He had recently been named to the latter position when he succeeded Fred Mackey when Mr. Mackey resigned as vice-president in charge of manufacturing. Mr. Greensward, who joined the company in 1922, previously was general manager of the Allis-Chalmers Norwood, Ohio, Works.

J. D. GREENSWARD

D. A. THOMAS

David A. Thomas has been appointed executive vice-president and general manager of Automatic Steel Products, Inc., by the company's board of directors. Mr. Thomas, formerly was executive vice-president, until recently held the same positions with the American Insulator Corp.

William L. Batt, minister in charge of the Economic Cooperation Administration mission to the United Kingdom and former president of SKF Industries, Inc., has been awarded the Howard Coonley Medal for his long, energetic and distinguished leadership in the standardization movement. The award is made annually by the **American Standards Association** to an executive "who by his practice and preachments has furthered the national economy through voluntary standardization." Mr. Batt, who has been associated with SKF for 45 years, became its president in 1922. He is a past director of the ASA and a past president of ASME. During the war he held a number of important positions including vice-chairman of the War Production Board.

Formal presentation of the award will be November 25, during ASA's 34th annual meeting.

Appointment of **Samuel S. Kistler** as research associate has been announced by **Peninsular Grinding Wheel Co. of Detroit.** Dr. Kistler is an internationally known chemical engineer and authority on abrasives. He resigned recently as director of research for Norton Co. to accept the deanship of the University of Utah college of engineering. Especially valuable results from Dr. Kistler's many years of research in the abrasives industry have been the development of new methods of manufacturing in both the resinoid and the vitrified fields of abrasives.

Two new vice-presidents have been announced by **American Engineering Co.** **H. Pagels** became vice-president in charge of manufacturing, while **F. C. Messaros** became vice-president in charge of engineering. Mr. Pagels, who has been active in the design and manufacture of heavy and medium metal products, joined American Engineering in 1945 as works manager. Mr. Messaros, who became associated with the company 25 years ago, has been chief engineer in charge of research and engineering pertaining to power plant, marine, fluid power and materials handling. He also is the author of a handbook covering steering gears and marine deck auxiliaries.

John L. Young, vice-president in charge of engineering for United States Steel Co., has been elected president of the **Association of Iron and Steel Engineers** for 1953. Other officers elected during the recent AISE convention were: first vice-president, **E. L. Anderson**, superintendent, electrical department, Bethlehem Steel Co.; second vice-president, **John H. Vohr**, general superintendent, Gary Steel Works, United States Steel Co.; treasurer, **W. H. Collison**, assistant general superintendent, blast furnace division, Great Lakes Steel Corp.; and secretary, **J. D. O'Roark**, assistant to manager, service and maintenance, Weirton Steel Co.

OBITUARIES

Clarence E. Bleicher, president and general manager of the **DeSoto** Division of **Chrysler Corp.**, died recently after a short hospitalization following a heart attack. Mr. Bleicher, who was 62, began his career with Chrysler as a mechanic at the firm's Maxwell Motor Car Co. plant in Dayton 29 years ago. When the Maxwell plant was closed in 1926, he moved to Detroit as assistant master mechanic for the Highland Park plant, and later became successively staff master mechanic in charge of liaison between engineering and manufacturing divisions, vice-president and general manager of DeSoto, and finally president in 1944.

C. E. BLEICHER

He was a long-time friend of the ASTE and had contributed considerably to its strength and influence. Readers of THE TOOL ENGINEER will remember Mr. Bleicher as the "Man on the Cover" of TE's February, 1952, issue.

Frederick L. Curtis, retired vice-president of **Raybestos-Manhattan, Inc.**, and former general manager of the Manhattan Rubber Div., died recently at his home in Passaic, N. J. He was 84 years old. Mr. Curtis, who was believed to be the oldest pioneer in the American rubber industry, joined The Manhattan Rubber Mfg. Co., in 1893 as office manager. Later he was secretary, then a director, and finally senior vice-president and assistant general manager. In the merger to form Raybestos-Manhattan in 1929, he became treasurer and later vice-president. He assumed the position of general manager in 1940 on the death of Col. Arthur Farragut Townsend, one of the founders of Manhattan. Mr. Curtis also was one of the founders and first president of New Jersey Engineering & Supply Co.

Less than two weeks after the death of Mr. Curtis, **William H. Dunn**, the second old-time executive of the Manhattan Rubber Div., died at his home in South Orange, N. J. He was 69. Mr. Dunn joined Manhattan as comptroller 36 years ago. He became a member of the executive committee in 1937 and a member of the board of directors two years later. He had retired in 1950.

Good Reading

A GUIDE TO SIGNIFICANT BOOKS AND PAMPHLETS OF INTEREST TO TOOL ENGINEERS

DESIGN AND USE OF CUTTING TOOLS, *by Leo J. St. Clair. Published by McGraw-Hill Book Co., 330 West 42nd St., N. Y. 36. 437 pp; price, $7.00.*

The author, who has had wide experience in the metalworking field, came to the conclusion that one of the best ways to stop misuse of tools was mass education, and that the best way to attain this goal was through a book. This volume is the result. It is written for machinists, tool grinders and other shop men who work on the production lines.

A great deal of attention has been given to the single-point tools, since they are the most widely used type of tool. The principles involved in the correct design and the use of the single-point tool are common to the more complicated cutting tools. The misuses of cutting tools have been described, and the results of these misuses, as well as how to avoid them, are demonstrated.

The book is also aimed at tool engineers and cutting tool designers. It contains valuable information on cutting tool usage and application. More than 200 illustrations, charts and tables are included for reference purposes.

TECHNICAL REPORTING, *by Joseph N. Ulman, Jr. Published by Henry Holt and Co., Inc., 383 Madison Ave., N. Y. 17. 289 pp; price $4.75.*

The author says he has tried to write this book from the point of view of those who have reached the stage where they have something to communicate and are in a frame of mind for serious consideration of the material presented for guidance and instruction. He has concentrated on those principles which seem to be most often omitted by technical writers in the preparation of their material, and has only lightly touched on the ones which do not seem to be slighted.

One section of the book outlines important fundamental principles, followed by another which outlines the general procedure to be followed. He then treats the various forms of expression which technical writing may take.

Another section of the book is devoted to the tools to be used in writing such as style, grammar, punctuation and mechanics. A final section deals with visual presentation, with particular emphasis on making charts, graphs and other illustrations clear and understandable.

MECHANICS: *Part I—Statics, Part II—Dynamics, by J. L. Meriam. Published by John Wiley and Sons, Inc., 440 Fourth Ave., N. Y. 16. Part I—330 pp; price, $4.00. Part II—330 pp; price, $4.00.*

These two volumes have been written as an engineering treatment of the two subjects, statics and dynamics. They are said to reflect the conviction of the author that the student does not acquire a full and useful appreciation of basic principles until he has progressed from the relatively simple and symbolic problems to the more practical and interesting engineering situations.

The author has collected a total of 1272 practical engineering problems for inclusion in the two volumes. Nearly all of them are illustrated with line drawings for clarity. Development of principles is followed in a progressive manner with sample problems in which all steps of the solution are explained. The other practical problems have answers to more than half of them. The remainder are there to tease the user's ability to apply what he has learned.

Statics begins with an overall introduction to the field of mechanics and proceeds from force systems through equilibrium. Emphasis is on the relatively few principles which govern all cases rather than detailed differentiation of special cases. The coverage of statics is broadened by the treatment of shear and moment distribution in beams and by a presentation of the method of work leading to the energy criterion for equilibrium.

The second part, *Dynamics*, is a sequel to the first volume and is similar in pattern and emphasis. Kinematics is treated separately from kinetics. Emphasis is on the direct use of the equations of motion, although the inertia-force method is described and used alternately.

Work-energy, impulse and momentum, variable mass and mechanical vibrations are also covered in much the same manner.

TAPS AND DIES FOR UNIFIED AND AMERICAN SCREW THREADS has been published by the Tap and Die Division, Metal Cutting Tool Institute. Copies of this booklet are available for *50c* from the Metal Cutting Tool Institute, 3114 Chrysler Bldg., New York 17.

WELDING WITH STAINLESS STEEL ELECTRODES, published by the Lincoln Electric Co., Cleveland 17, Ohio. This booklet of 32 pages contains a reprint of material from the Procedure Handbook of Arc Welding Design and Practice. It covers welding of straight chromium steels, together with procedures. Price is *25c* postpaid.

BASIC MATHEMATICS FOR ENGINEERING AND SCIENCE *by Walter R. Van Voorhis and Elmer E. Haskins. Published by Prentice-Hall, Inc., 70 Fifth Ave., N. Y. 11. 619 pp; price, $7.65.*

The authors have attempted to include in the same book a unified presentation of college algebra, trigonometry and analytic geometry. The function concept is employed to unify many of the topics covered in conventional books. Selected definitions and fundamental relations usually treated separately in algebra, trigonometry and analytic geometry are presented together in the early chapters as a preparation for analysis in later chapters. Certain phases of each of these subjects are given concentrated attention to develop a critical attitude toward analytical processes and to provide proper background for more advanced courses.

Emphasis is given to applications from science and engineering, and an attempt is made to give the user an appreciation of the interrelationship of mathematics and other subjects. The style of presentation is designed to encourage the student to read the material and to proceed on his own. Explanations and proofs are given in detail, and these are followed by numerous lists of problems of graded difficulty.

WELD DESIGN, *by Harry D. Churchill and John B. Austin. Published by Prentice-Hall, Inc., N.Y. 11. 216 pp; price, $6.65.*

Presented here is a concise treatment of welded machine-base design. Although there is considerable literature available describing cast machine bases, very little has been written concerning the welded type of base. This is due to the fact that only recently has electric arc welding become a recognized tool to be used in machine design. Even though engineers are aware of the process and recognize its value in fabricating machine bases, they are unable to use it because of a lack of welding design experience and information.

Economical welding design is largely dependent on a proper choice of components. The authors, therefore, in addition to a theoretical treatment of the subject, have also included a treatment of the materials to be used, as well as information on methods for processing plates and structural shapes.

A fifteen-page appendix contains complete stress-design data, weld stresses and how to figure them, allowable loads, and beam deflection equations. A second appendix contains an extensive bibliography which lists more detailed sources of information in current and recent periodicals, journals, pamphlets and books.

Who's Meeting —and Where

Oct. 27-30. American Gas Association. Annual meeting and exposition, Municipal Auditorium, Atlantic City. Secretary and convention manager Kurwin R. Boyes, 420 Lexington Ave., New York 17, can give full details.

Oct. 27-31. Electrochemical Society Inc. Fall meeting, Mt. Royal Hotel, Montreal. Address Dr. Henry B. Linford, 235 W. 102nd St., New York 25, for more information.

Oct. 28-29. Materials Handling Conference sponsored by Westinghouse Electric Corp. Hotel Statler, Buffalo. Contact the company for details of program.

Oct. 29-31. American Institute of Electrical Engineers. Fifth annual Machine Tool Conference. Hotel Ten Eyck, Albany, N. Y. Additional information from J. J. Delfs, chairman, AIEE Machine Tool Sub-Committee, c/o General Electric Co., Schenectady 5, N. Y.

Oct. 30-Nov. 2. National Tool & Die Manufacturers Association. Annual meeting, Hotel Sheraton, Rochester, N. Y. Full particulars from executive secretary, 906 Public Square Bldg., Cleveland.

Nov. 3-4. Society of Automotive Engineers. National diesel meeting, Hotel Chase, St. Louis. John A. C. Warner, society secretary, 29 W. 39th St., New York 18, can give more information.

Nov. 5-7. Industrial Management Society. Sixteenth annual time and motion study, and management clinic. Hotel Sheraton, Chicago. Address headquarters, 35 E. Wacker Dr., Chicago 1, for details.

Nov. 5-9. Scientific Apparatus Makers Association. Mid-year meeting, industrial instrument, laboratory equipment, optical, aeronautical and military instrument sections. The Homestead, Hot Springs, Va. For more facts write association, 20 N. Wacker Dr., Chicago 6.

Nov. 6-7. Society of Automotive Engineers. National fuels and lubricants meeting. The Mayo, Tulsa, Okla. Address 29 W. 39th St., New York 18.

Nov. 8. American Society of Tool Engineers. Chicago Chapter sponsoring, annual midwestern tool engineering conference, Urbana, Ill. Conference arrangements by Prof. L. E. Doyle, University of Illinois.

Nov. 9-11. Grinding Wheel Institute. Annual meeting, Hotel Claridge, Atlantic City. Address institute, 2130 Keith Bldg., Cleveland 15.

Nov. 9-11. Abrasive Grain Association. Annual meeting, Hotel Claridge, Atlantic City. For added details, address headquarters, 2130 Keith Bldg., Cleveland 15.

Nov. 10-11. The Magnesium Association. Annual meeting and exhibit, Hotel Biltmore, New York. Association headquarters, 122 E. 42nd St., New York 17, can give particulars.

Nov. 10-13. The Wire Association. Annual meeting, Hotel Carter, Cleveland. Write 453 Main St., Stamford, Conn., for more information.

Nov. 10-14. National Electrical Manufacturers Association. Annual meeting, Haddon Hall, Atlantic City. Details may be had from headquarters, 155 E. 44th St., New York 17.

Nov. 14. American Iron & Steel Institute. Regional technical meeting, Hotel Mark Hopkins, San Francisco. Address the institute, 350 Fifth Ave., New York 1, for more information.

Nov. 19. American Standards Association. Annual meeting, Waldorf-Astoria Hotel, New York. Write association, 70 E. 45th St., New York 17 for full particulars.

Nov. 20-21. Seventh Midwest Quality Control Conference, Claypool Hotel, Indianapolis.

Nov. 20-21. American Society for Quality Control. Seventh Midwest Quality Control Conference, Claypool Hotel, Indianapolis. Contact general chairman, William E. Spencer, c/o Allison Div., GMC, Indianapolis, for more information.

Dec. 1-16. Power and Mechanical Engineering. Twentieth national exposition, Grand Central Palace, New York.

Dec. 3-5. Society for Experimental Stress Analysis. Fall meeting and exhibition, Hotel McAlpin, New York. Information on meeting from Prof. George Herrmann, c/o Dept. Civil Engineering, Columbia University, New York 27; details on exhibition from Greer Ellis, P.O. Box 77, Pelham 65, N. Y.

TRADE LITERATURE

Free Booklets and Catalogs Currently Offered By Manufacturers

Ball Bearings

Brochure "The Lubrication of Fafnir Ball Bearings" discusses everyday problems of ball bearing lubrication and maintenance, as well as the basic reasons for lubrication along with what are the advantages of oil or grease. Specific illustrations of bearing and housing design also included. **The Fafnir Bearing Co.**, New Britain, Conn. **L-11-1**

Stainless Steel

Booklet, "Sharon 430 Stainless Steel", aimed at helping solve many of the problems involved in the use of straight chromium type stainless steels, includes detailed fabricating instructions as well as numerous illustrations of straight-chrome stainless products in use for many years. **Sharon Steel Corp.**, Sharon, Pa. **L-11-2**

Metal Treating

Various possibilities of advantageously using peroxygen compounds in treatment of metal surfaces outlined in Bulletin 39 "Surface Treatment of Metals with Peroxygen"; covers four general types of procedures for treating metal surfaces with oxiding agents and actual or potential usefulness of peroxygen compounds as applied to each is described in detail; cites examples. **Becco Sales Corp.**, Station B, Buffalo 7. **L-11-3**

Castings

Eight-page brochure presents design and engineering data on "Hyprecision" castings; contents page serves double duty in summarizing design details with page information for more involved discussions, and includes such items as tolerances, alloys, surface detail, production lots, etc. Illustrated. **The Sessions Foundry Co.**, Bristol, Conn. **L-11-4**

Coolant Pumps

Catalog covers company's line of coolant pumps; detailed drawings and specifications explain each model; cut out index facilitates reference to various types of pumps available. Also contains information on motors for special or unusual requirements such as tropical insulation, fungus proof, permatex sealed and explosion proof. **The Ruthman Machinery Co.**, Reading Rd., Cincinnati, Ohio. **L-11-5**

Pipe Threads

Vol. IV No. 1 of Die Headlines, entitled "American National Pipe Threads —Designations and Differences in Specifications" attempts to clear up misunderstandings concerning variations in all kinds of pipe threads; tabulated data and drawings simplify text; includes proper designation letters by which different types of taper pipe and straight pipe threads can be specified. **The Eastern Machine Screw Corp.** New Haven 6, Conn. **L-11-6**

Machining

Well-illustrated brochure, M-1776, marking 68 years of company progress and outlining its activity in the field, deals with Cincinnati machines for milling, lapping, grinding, broaching, die sinking, metal forming, flame hardening and sharpening in addition to treating grinding wheels and cutting fluid. Various models are presented with discussion of special features, uses, advantages and specifications. **The Cincinnati Milling Machine Co., Cincinnati Grinders Inc.**, Cincinnati, Ohio. **L-11-7**

Mill[illegible] Machines

Bulletin #25 illustrates and describes line of semi-automatic production type mill[illegible] machines suitable for variety of [illegible]ing operations on small and medium-sized parts; includes specifications for the various models of these U. S. Multi-Millers and discussions of their uses in special applications, and accessory equipment available. **U. S. Tool Co.**, Ampere (East Orange), N. J.

L-11-8

Chain

Book No. 2510 on 3/16-in.-pitch silent chain describes and illustrates this product which is so tiny that five pitches make up less than an inch of chain. Tables, engineering data and instructions for correct selection of chain drives are included as well as photos of typical applications Especially interesting to designers and users of machinery employing fractional horsepower. **Link-Belt Co.**, 307 N. Michigan Ave., Chicago 1. **L-11-9**

Speed Reducers

Illustrated brochure A-614-A offers full engineering information and selection data on complete line of Torque-Arm speed reducers ranging to 43 hp and shaft-mounted reducers covering speed range of 12 to 330 rpm. Cross section views and engineering diagrams show proper positioning for installation. **Dodge Manufacturing Corp.**, Mishawaka, Ind. **L-11-10**

Hack Saws

Brochure describes complete line of hack saw blades for use on hack sawing machines and for hand hack saw frames. Helpful information and valuable work hints are given for obtaining the best in finish and production for both machines and hand operations. **The DoAll Co.**, Des Plaines, Ill. **L-11-11**

Cylinders, Hydraulic

Eight-page hydraulic cylinder bulletin H-104G gives complete engineering, design, construction, mounting and dimensional data covering line of square-design hydraulic cylinders for 2000-3000 psi operation. Extensively illustrated. **Miller Motor Co.**, 2040 N. Hawthorne Ave., Melrose Park, Ill.

L-11-12

Roller Gear Drives

Four-page folder introduces line of roller gear drives explaining their advantages in cost and efficiency. Also pamphlet reprint, "Designing Cams", from *Machine Design* presents extensive discussion of the subject, sumarizing pertinent information on inertia and vibration phenomena in cam operation and offering a practical procedure for limiting their destructive effects. **The Ferguson Machine & Tool Co.**, Ferguson, Mo. **L-11-13**

Electrode Comparator

Nine-inch welding electrode comparator slide rule permits comparison of General Electric welding electrodes with those of other electrode manufacturers. Designated GEN-37B, the handy slide rule provides an answer in a matter of seconds as the operator designates a choice for comparison. Available at GE Welding Distributors. **General Electric Corp.**, Schenectady 5, N. Y. **L-11-14**

Materials Handling

"How to Operate a Lift Truck", 24-page comprehensive manual for use in training lift truck operators in safe and efficient operation; also contains information of protective maintenance, safety and basic materials handling. Illustrated. Hyster Co., 2902 N. E. Clackamas St., Portland 8, Ore. **L-11-15**

Corrosion Prevention

Two technical bulletins, VT-1 and GB-1, deal with a modern method of protecting ferrous metals and aluminum from rust and corrosion through specially treated paper coverings instead of coatings of oil, grease, etc. The first serves as a primer on the volatile corrosion inhibitors, covering the subject by pertinent questions and answers ranging from definitions to basic data on applications, effects of moisture, shelf life, etc. The second deals with "Dry-Vapor Pack-velopes", a positive protection for Steel and Aluminum", explaining their uses, advantages and citing specific examples comparing methods of corrosion control. Industrial Packaging Division, **Berlin and Jones Co.**, Inc., 601 W. 26th St., New York 1.

L-11-16

Abstracts of Foreign Literature

By M. Kronenberg

Grinding Research

Considerable time has been spent by W. Wolfram on grinding research in 1941-1944 but his work has not been published until recently in an article in *Werkstattstechnik & Maschinenbau* of March 1952. He was particularly concerned with finding a factor which would characterize the cutting capacity, tool life, etc. of grinding wheels. Manufacturers of grinding wheels and tool engineers have long been searching for such a factor but it is difficult to determine because of the many variables involved.

The author found that the ratio of the specific cutting force in plunge cutting operations to the unit grinding wheel wear could be used for this purpose; he calls this ratio the load factor, which depends to a great extent on the maximum chip thickness in the process of metal removal. In this way it is possible to find the working range of the so-called self-sharpening wheel. A high load factor indicates a low wheel wear and thus low tool cost. If this factor coincides with a large chip thickness, metal removal will be optimum at lowest cost. Microphotographs of grinding wheel structures at different stages of wear illustrate the concept of working range which was found to agree well with the derived data. In addition to these photos, the article is illustrated by diagrams of wheel wear and load factor and by photographs of the devices used for measuring wear, tangential cutting force and of the optical instruments for observing and photographing the wheel surface and single grains.

Metal Analysis

A relatively simple method for determining the most important constituents in the microstructure of metals has been developed by R. Boekler as indicated in an article published in the March 1952 issue of *Werkstattstechnik & Maschinenbau*. The method consists of a modified Brinell Test. Instead of using a ball, a cone of 90 deg is employed for making the indentation at

pressures up to 275 lb. The wall which is generated around the indentation is analyzed under a microscope and gives a great number of clues concerning the microstructure.

By measuring the grains in the wall it is possible to determine the size and shape of the softest constituents and also to find impurities, effects of heat treatment, etc. The author claims that two metals are equivalent only when both the Brinell hardness and the wall analysis data of the metals are sufficiently in agreement. Photos of two different steels, having the same Brinell hardness but exhibiting different wall analysis data prove that it is easy to tell one material from the other.

The method is also recommended for testing weldments, for improving machinability, and in other similar cases where the polishing of specimens etching, etc. takes too much time. It was found that machinability related to drilling operations could be controlled by observing the grain size which should be kept small. Larger grain size was mostly associated with breakage of twist drills.

Hydraulic Punches

W. Schmidt reports in the same issue of *Werkstattstechnik & Maschinenbau* on practical experiences with deep drawing operations when using oil-filled punches, as suggested two years ago in the same magazine. The author comes to the conclusion that it is not practical to employ hydraulic punches because the strain in the material to be drawn is very great, causing uneven wall thickness in the finished part. The use of such punches is recommended only in special cases where materials with large elongation factors can be used in spite of increased cost.

Cams

La Machine Moderne published in June 1952 a special edition dealing exclusively with the design and application of cams. Nearly a hundred different designs are discussed and are illustrated by numbers of drawings, sketches, etc.

The treatise is divided into four main chapters in which cams for general application, cams for special application, cams for producing intermittent motion and cams for generating reciprocating motions are analyzed. There are numerous examples useful to tool engineers concerned with fixture design or machine tools, such as a cam for a lathe so designed that an irregularly shaped workpiece can be machined at constant rake angle of the tool. Another interesting example pertains to a high-speed transmission for intermittent motion where the impact

of recurrent engagement is substantially reduced. Mathematical formulas and suggestions for the manufacturing of cams are given in the appendix.

Technical Dictionary

An English-French and French-English dictionary is being published in *La Machine Moderne* of May, June and July, 1952, which will be of interest to tool engineers looking for translation of terms related to machine-shop practice and machine tools. The dictionary is divided into types of machine tools, such as lathes, boring mills, etc., so that all terms concerning a given machine are under the same heading. Pictures with reference numbers supplement the translations prepared by P. Nichi and a group of engineers of Alfred Herbert Ltd., England.

Electronic Machine Control

The principles underlying the development of an electronically controlled dividing machine designed for manufacturing very accurate scales are outlined by F. Turrenttini in *Industrielle Organization* Nr. 6, 1952. Such scales are used in the jig-borers, designed by the author's company. After discussing the deflection occurring in motion screws and the adverse effect of the oil film on the accuracy of adjustment, the author indicates that an image of a master scale is now being used in place of screws. A photoelectric device controls the adjustment of the measuring table and the graduation marking. The measuring table is stopped by superposition of two electrical impulses at an accuracy of 0.000004 in. per 3.28 ft of length. In order to save time, the table is moving rapidly from graduation mark to graduation mark, but is slowed down shortly before stopping, to a speed of 0.000020 in. per second.

With the aid of an electrical amplifier it will be possible in the future to measure deviations as small as 0.0000004 in. The article is supplemented by illustrations and diagrams of the photoelectric microscope.

Industrial Music

An investigation on the effect of music on productivity in machine shops has been carried out by W. Brunner and is presented by him in the same issue of *Industrielle Organization* as the above abstracted article. The author concludes that music is useful when handled with care, but that adverse effects have also been noticed, particularly in cases where the music was broadcast for too many hours. Selection of music, the general effect of music, technical details of broadcasting and similar items are analyzed in the paper.

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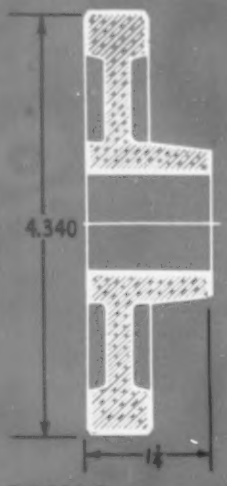

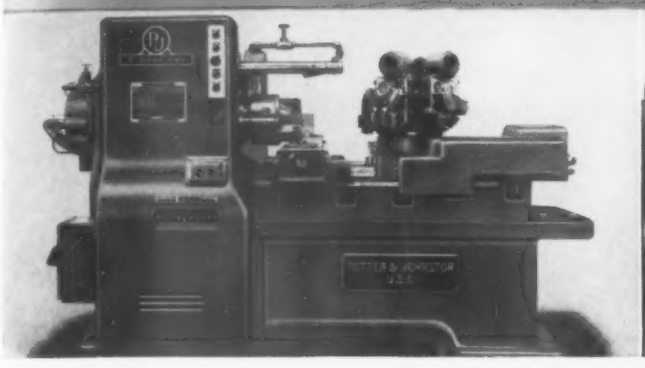

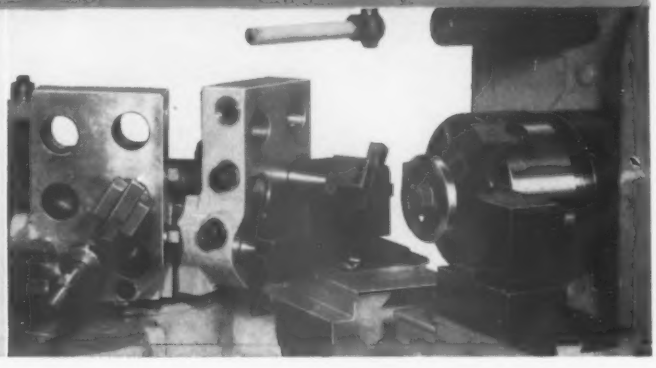

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Technical Shorts..

UNUSUAL CORROSION resistance to ordinarily harmful fumes and liquids, lightness in weight and high strength make titanium of special interest to manufacturers. Experimentation still is under way at several DuPont Co. plants to evaluate performance and commercial potential of the "wonder metal" in specialty tubing. Uses for the tubing which have been under study include application for condenser tubes operating in salt water and in chemical plant equipment. At the same time, use in aircraft hydraulic lines is under careful metallurgical investigation. Results indicate promise in this field since these lines must be light in weight yet capable of withstanding peak internal pressures as high as 6000 psi; requirements met by titanium.

The studies now going on have brought out several points of general interest. Titanium has the property of reacting with all common gases, allowing the prediction that it will find important uses in the construction of radio tubes and other vacuum electronic devices. Its "gettering" (cleaning gases by binding them on its surface) ability, while less than that of barium, berylium and zirconium, is quite high. At the same time, it is cheap by comparison with these rarer metals, and can be produced in all forms required in electronics application. The melting point for the pure metal is 3272 F, and its hot strength is fairly good. Because of this, Titanium vacuum tube parts are being tested in the double role of electrical element and continuous getter. If indications hold true, it may mean prolonged life for electronic tubes.

In line with the experimental work and the interest involved, the Superior Tube Co. displays of new applications of titanium tubing and important advances of this year's metallurgical research on fine small tubing drew special attention at the National Metal Exposition this October.

* * *

GENERAL ELECTRIC CORPORATION has worked out a visual program aimed at helping boost American productivity. The plan incorporates a step-by-step approach to increased industrial mechanization by formalizing the broad aspects of the problem that in themselves seem difficult to apply.

With documented examples the program is designed for use by large industrial firms, machinery manufacturers, electric utilities, etc., consulting engineers, and presents the stages of mechanization from the replacement of hand operation by simple machines; simple to improved mechanization; to full automatic control and eventually to continuous process. It reflects the experience G. E. has gained in promoting production in its own plants.

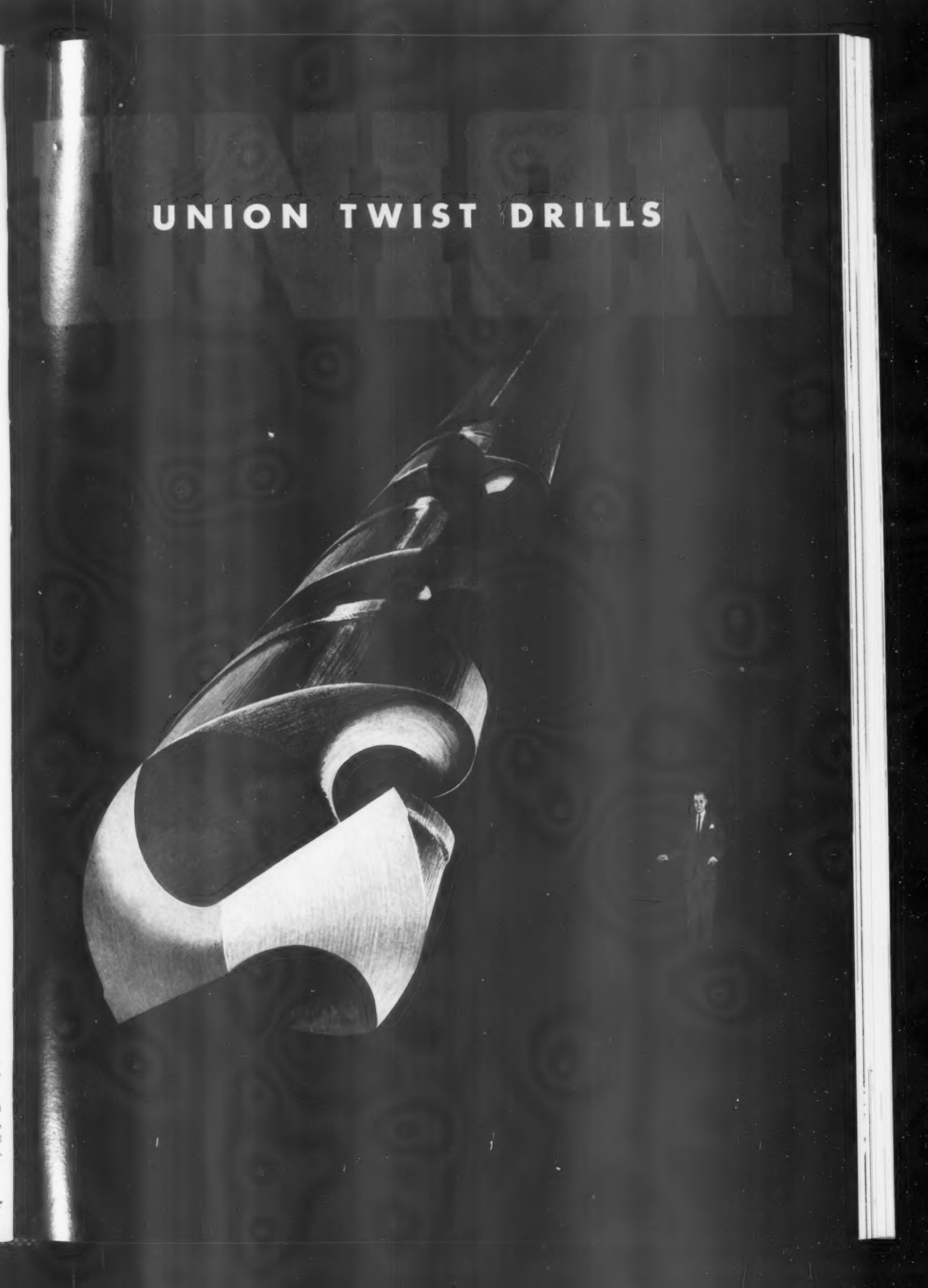
The program, consisting of three basic parts (including a 16 mm. sound-color film, a manual and a survey form and check list), encourages industrial management to raise each of its manufacturing operations at least a notch on the scale.

Told through the medium of a professional methods engineer, the movie dramatizes the theme by means of interesting and impressive examples. Still more specific information is contained in a manual (GEA-5789) to help management tailor a program to its own needs and activities. It explains the details of "Progressive Mechanization", what it is, and what its effect on productivity, product quality and costs are and how it can be accomplished.

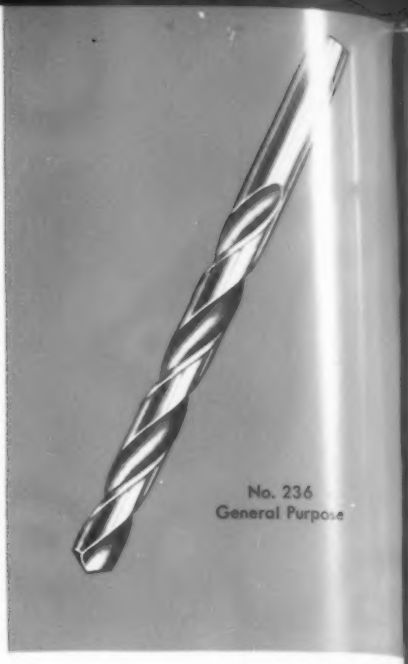
Third part of the program, survey form and check list, is a single sheet from the manual which on one side has a form for enumerating the machines and processes recommended for investigation, and on the reverse has a check list of suggested areas of improvement. Supplementary brochures on particular equipment also are included.

Those who want further information may get gratis copies of the manual, publication GEA-5789, or the entire kit may be purchased from G. E. Schenectady 5, N. Y.

UNION TWIST DRILLS



There's a UNION twist drill for top performance on every job!



Whether you're working on the hardest alloy steel or softest iron . . . on such non-ferrous metals as brass, copper, aluminum, magnesium or zinc . . . on slate, marble, rubber, plastics, wood or any other non-metal . . . there's a type of Union Twist drill that will give you tops in accurate, trouble-free, money-saving performance.

That goes, too, for a normal working pace or for high production records . . . and for every type of drilling equipment. No matter what the material or the conditions, *you're sure of best results when you specify Union!*

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters • Gear Cutters • Twist Drills • Hobs • Reamers • Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates...

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers, Twist Drills . . .

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates

No. 238
Fast Spiral

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No. 595
Four Groove

6" and 12"
Aircraft Extension

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No. 1173
Oil Hole

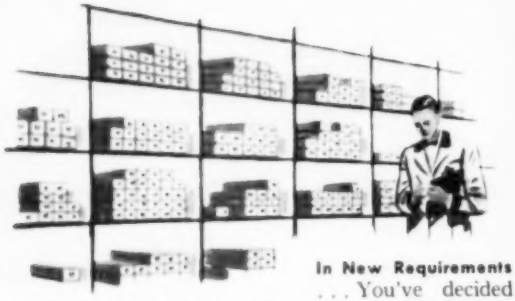
No. 510
Taper Length

No. 500
Carbide Tip

No. 550
Cobalt Super High Speed

PRINTED IN U.S.A.

...and here's how your UNION distributor's teamwork pays off for you



In New Requirements . . . You've decided on a type of twist drill you've never used before. Can you get quick delivery from your Union Distributor? *You sure can!* It's part of his job to keep complete stocks to meet your every need in cutting tools.

In Routine Problems . . . You're puzzled about the types of drills to use on a job that's new to you. *Ask your Union Distributor!* Chances are, the job is familiar to him. He's in constant touch with the latest in cutting tool practice. You can trust him to steer you right.

In Emergencies . . . You need certain cutting tools — not "soon" but right away — in order to avoid a production stoppage. *Don't worry — you'll get them!* Your Union Distributor is ready to deliver any emergency order, at any time.

In Unusual Problems . . . You've hit a real production snag — say, a new material that resists every tool you've tried. *Contact your Union Distributor!* He'll call in a Union Factory Representative—bringing you the expert technical aid that has licked some of industry's toughest cutting tool problems.

He's on YOUR Team, too

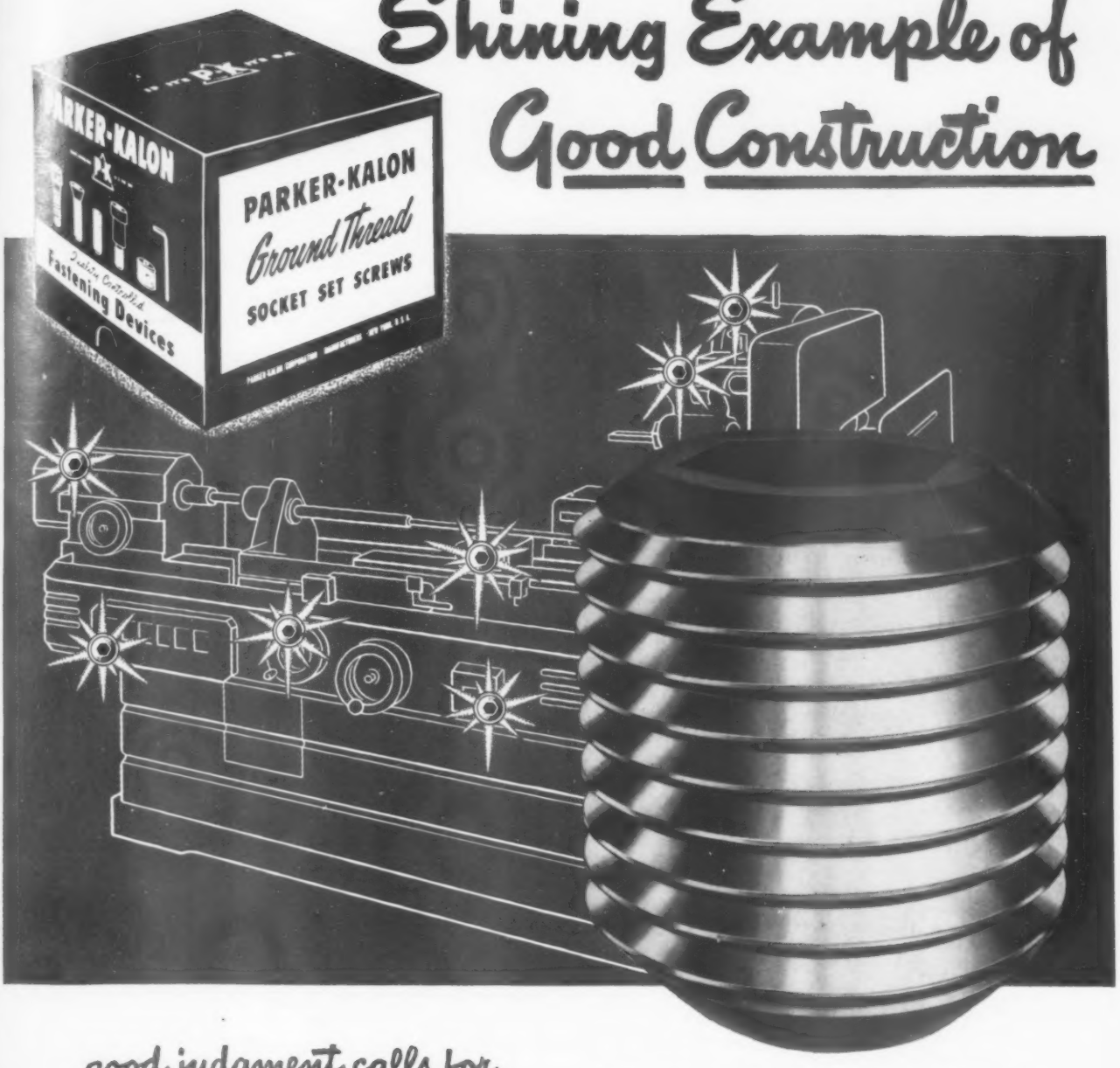
Your Union Distributor is a valuable co-worker in many ways. Acting as your "warehouse," he eliminates the trouble, space and expense of keeping big inventories in your plant. Through him, the Union factory with all its facilities becomes your next-door neighbor. Take advantage of his helpful teamwork that, day in and day out, saves you time, labor and money.

First team in cutting tools...

UNION and your LOCAL DISTRIBUTOR

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Shining Example of Good Construction



good judgment calls for PARKER-KALON® when good design calls for SOCKET SCREWS

Whether you make simple jigs and fixtures or giant machine tools, assembly with P-K Ground Thread Socket Set Screws will reflect superior construction throughout. Any buyer associates topmost quality with their super-smooth, gleaming *ground thread* finish.

This sales-feature is only one advantage. Assembly moves faster, too. Workers like their clean, burr-free contour, their easy keying, their dependable Class 3 Tolerance.

Ask for samples. See why P-K Ground Thread Socket Set Screws will put your product out in front, assembly-wise and sales-wise. Parker-Kalon Corporation, 200 Varick St., New York 14.

DELIVERIES ARE BETTER CHECK WITH P-K FIRST

Your P-K DISTRIBUTOR *has good news. His stocks of P-K Screws are steadily improving. The size and type you need may now be readily available. Ask about it. Remember— "If it's P-K . . . it's O.K."*

SIZE-MARKED CAP SCREWS • GROUND THREAD SET SCREWS • FLAT HEAD CAP SCREWS • STRIPPER BOLTS • PIPE PLUGS • HEX KEYS

SAVE YOURSELF

from costly, excessive wear

Piasecki Helicopter Corporation
Morton, Pennsylvania

Problem: To find a material that withstands severe shock loads, high operating speeds, corrosive action of the elements and, at the same time, provides good bearing qualities when needed for such parts as:

Dowel-Rotor Blade Leading Edge, Bushing-Trim Mechanism, Bearing-Collective Pitch Lever Flange, Bearing-Collective Pitch Lever Grip, Bearing-Collective Pitch Lever Throttle, Bushing Collective Pitch Friction Slide, Bushing-Trim Control Actuator Support Collar, Bushing-Flexible Shaft Coupling, Support Assemblies — Power Plant Engine Controls — Fuel Shut-Off, Cone-Inner Fan Hub Drive System, Cone-Outer Fan Hub Drive System, Collar-Fan Hub-Drive System, Swivel Details — Pilot's Controller Arm on the Auto Pilot; Bushing-Sway Structure Fitting, Upper Attachment; Washer-Rescue Hatch Actuator.

Solution: AMPCO METAL

Results: The performance of Piasecki Helicopters under all kinds of conditions is proof of the life-saving dependability of these units. This ability to "take it" has established Piasecki as a leader in the development of transport helicopters.

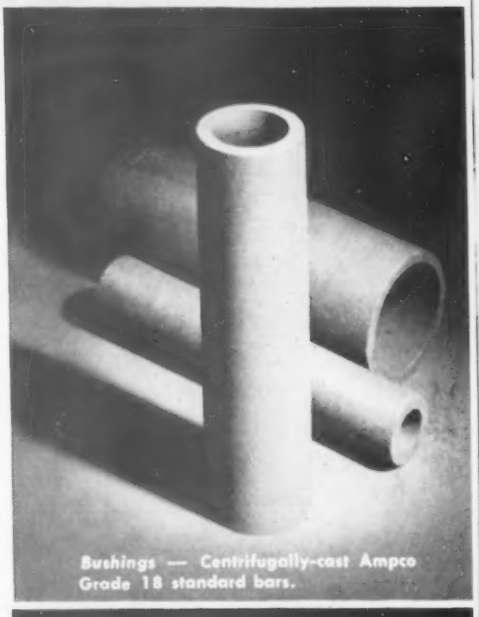
IT'S PRODUCTION-WISE TO AMPCO-IZE!

Tandem-rotored six-place [illegible] with large rescue hatch. Its [illegible] sion—search and rescue [illegible] transport.

Rear cone for airplane propeller — Centrifugally-cast.

Gear for metal spray gun — Extruded-rod.

with AMPCO* METAL



Bushings — Centrifugally-cast Ampco Grade 18 standard bars.

Here are the properties of Ampco Metal that appeal to designers and plant-operating men — properties that increase the service life of machines and reduce upkeep costs:

High compressive strength — Ampco Metal doesn't squash out. . . . High resistance to corrosion, erosion and abrasion. . . . High impact and fatigue values. . . . Excellent bearing qualities.

Because Ampco Metal has this ability to stand up under the severest kind of service, leading companies, like Piasecki Helicopter Corporation, use these outstanding aluminum bronze alloys to provide an extra margin of safety and dependability.

If you have a wear problem in either product or plant, investigate the cost-saving properties of Ampco Metal. You can get it in practically any form you need — sheet, plate, sand and centrifugal castings, forgings, bars, tubes, welding wire and electrodes. For further information consult your nearest Ampco field engineer or send this coupon.

*Reg. U. S. Pat Off.

Marine reversing gear component — Sand-cast.

Tear out this coupon and mail today!

Ampco Metal, Inc.

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West Coast Plant

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AMPCO METAL INC., Dept. TE-11, Milwaukee 46, Wis.

Send me your free Ampco Metal literature giving descriptions and general applications of Ampco Metal.

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Company.....

Company Address.....

City..... (.....) State.....

Card boosts production from 90 holes per tap to 18,000!

CARD TAPS

Producing armament parts for the government, a large metal-working firm was tapping extruded holes in thin steel for size $\frac{3}{8}$-24 screws. Taps used were Card three-flute, spiral pointed, high speed steel, commercial ground. Due to the low carbon, low sulphur content of the steel part, it became welded to the taps after 48 to 90 holes — so that holes were reamed or drilled out, leaving no threads.

Card technicians tried various cutting oils and other styles of taps without effect. Then, deciding that a dissimilar metal was needed between the tool and the work, they recommended chrome-plating the taps.

Results: The chrome-plated taps averaged 18,000 holes each, perfectly tapped to a No. 2 fit. One tap completed 35,000 holes.

SEE YOUR CARD DISTRIBUTOR FOR PROMPT DELIVERIES AND HELPFUL SERVICE

Your Card representative, backed by Card's expert engineering staff, is always available for aid in any tapping problem. S. W. CARD MANUFACTURING COMPANY, Mansfield, Massachusetts. Division of Union Twist Drill Company.

The CARD Quality

TAPS

Production Proved For Lasting Accuracy

Also makers of DIES • SCREW PLATES • DIE STOCKS
TAP WRENCHES

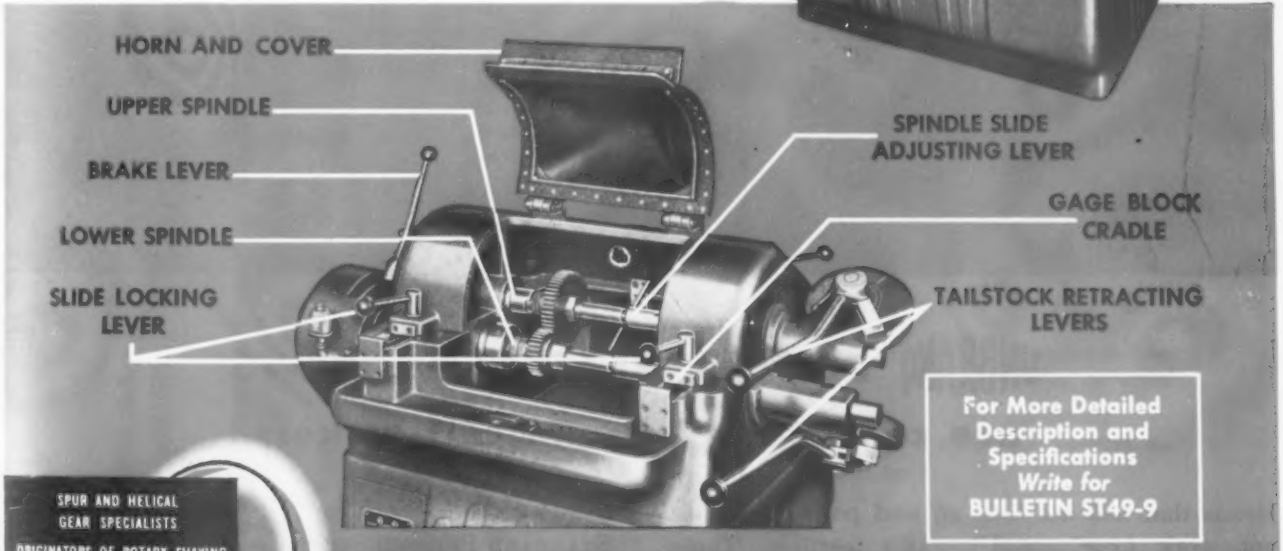
A RED RING SOUND TEST
is the Quickest Way to Screen Out
FAULTY GEARS

When a set of gears runs quietly and smoothly you can OK them for assembly with the assurance they will function properly in service. Such a test under varying speeds can be made easily and quickly by the average shop man.

If the sound test reveals objectionable noise the faulty gears are immediately routed back for correction. You won't waste time and expense by assembling them.

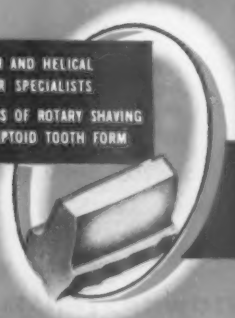
When you have a set of gears in the Sound Tester you can also check tooth bearing. Just use marking compound on one and observe its transfer to the mating gear. When the sound test reveals a nicked tooth the nick may be removed by a pencil grinder while the gear is still in the sound testing machine.

Special sound testing machines are available to meet individual requirements.



For More Detailed Description and Specifications *Write for* BULLETIN ST49-9

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM



NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

UNBRAKO® SQUARE HEAD SET SCREWS

are consistently strong self-lockers

Heads that *will not twist off* and points that will not work *loose* are UNBRAKO features. These screws are particularly useful in severe service applications and on high speed, vibrating equipment. Write for your copy of UNBRAKO *Standards*. STANDARD PRESSED STEEL Co., Jenkintown 37, Pa.

Standard points are self-locking knurled cup and half dog. Standard sizes are ¼" to 1". They are available from distributors' shelves.

UNBRAKO SOCKET SCREW DIVISION **SPS** **JENKINTOWN, PENNSYLVANIA**

ARMOR-TUF

THE AMAZING NEW STEEL HARDENING COMPOUND

"ARMOR-TUF hardens tools and steel parts as easily as baking pie, and much more quickly."

Now used by leading steel processors and other manufacturers everywhere!

You can use milder, cheaper steels for many applications and machine them before hardening. The saving is two-fold: less expensive steels and lower machining costs. ARMOR-TUF gives low carbon steels the cutting and wearing properties of tool steels. You can harden the softest steels to a degree ordinarily obtainable only in high priced steels.

Service between sharpenings increased 10 times and more. Tools hardened with ARMOR-TUF hold their edges many times longer. The advantages: substantially reduces resharpening costs . . . saves on time lost changing dull tools . . . keeps tools in service . . . enables increased production as result of less frequent tool changing and sharpening.

As compared with the usual heat treating processes, the saving in time is great. Instead of hours, only minutes are needed. The entire hardening process takes less than ten minutes .

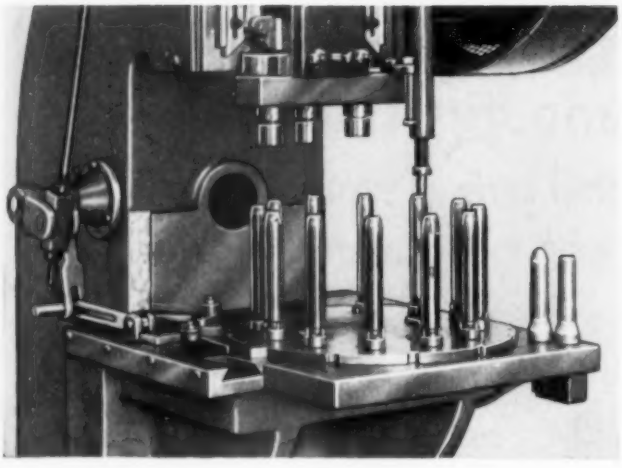
No CYANIDE, Absolutely — ARMOR-TUF is safe to use, contains no cyanide of any kind — there are no toxic fumes.

ARMOR-TUF IS UNCONDITIONALLY GUARANTEED TO INCREASE THE LIFE OF TOOLS AT LEAST 300%, OR YOUR FULL PURCHASE PRICE WILL BE REFUNDED.

Armor-Tuf Laboratories, Inc.

595 Fifth Avenue - New York 17, N. Y.

300% More Production Per Press with V & O Dial Feed



This production increase was obtained by the Blake Manufacturing Company, Clinton, Mass., on a pointing operation on flashlight cases. Under the old method, Blake employed two presses and two operators for this job. Pieces completed by the two men averaged 32 per minute, or 16 per man. With the V & O Dial Feed, one man operating one press produces 48 per minute, for an increase of 300% in per press production. It was also possible to add a third operation to improve the finish of the case and reduce rejects.

The Dial Feed designed and built for this manufacturer is typical of the tooling available at V & O. More and more manufacturers have come to realize that automatic dial feeds boost production rates, conserve manpower and greatly simplify operator motions. V & O does the complete job for you on Dial Feeds, from initial design through manufacture. You get a complete package.

DESCRIPTIVE CATALOGS Catalogs containing complete specifications and operating details on V & O Precision Power Presses and Feeds are available. Please write The V & O Press Company, 391 Union Turnpike, Hudson, N. Y.

Only the best is good enough

THE V & O PRESS COMPANY

Division of Emhart Mfg. Co.

HUDSON, NEW YORK

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889

USE READER SERVICE CARD; INDICATE A-11-146-1

Over 85% of the torque wrenches used in industry are

STURTEVANT TORQUE WRENCHES

Read by Sight, Sound or Feel

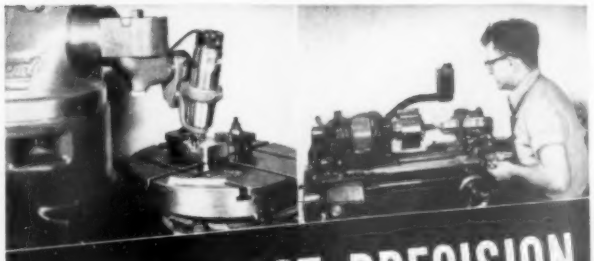
- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch ounces
...inch pounds
...foot pounds
(All sizes from 0-6000 ft.-lbs.)

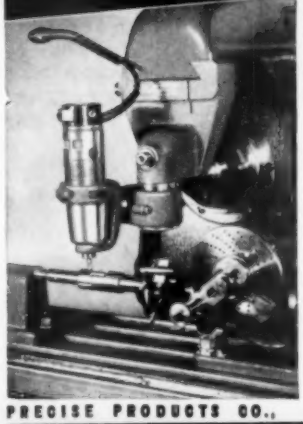
Every manufacturer, design and production man should have this valuable data. Sent upon request.

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

USE READER SERVICE CARD; INDICATE A-11-146-2



LOWEST COST PRECISION FOR TOOL ROOM AND PRODUCTION



ONE PORTABLE MULTI-PURPOSE PRECISE GRINDER-MILLER WITH MACHINE TOOL MOUNT DOES THE WORK OF A SINGLE-PURPOSE MACHINE COSTING 100 TIMES AS MUCH!

Little can be done today to reduce labor and material costs. For substantial savings employ new, better techniques. Mount PRECISE Grinder-Millers on lathes, drill presses, milling machines and other machine tools or use in special production set-ups. ¼ HP; speeds from 20,000 to 45,000 r.p.m.; 115 volts, AC-DC. Ruggedly built for continuous duty. All metal housing; rigid PRECISE quill; sealed micro-precision bearings. *High speeds and accurate PRECISE quill and chuck are ideal for tungsten carbide cutters.* PRECISE will grind, mill or finish any material from soft wood to the hardest alloy steel.

Write FOR CATALOG

PRECISE PRODUCTS CO., 1314 Clark St., Racine, Wis.

PRECISE GRINDER-MILLERS

USE READER SERVICE CARD; INDICATE A-11-146-3

FREE Cylinder Catalog and Templates offered by Ortman-Miller Co.

Book outlines several special features of O-M cylinders.

FREE

A new, 28 page catalog has just been released by the Ortman-Miller Machine Co. which gives complete engineering specifications, data on O-M's special internal locking system and special full listing of O-M parts. Prepared for designers and users of cylinders for any application, it covers standard, oversize and 2-1 piston rods, giving full information on all sizes from 1½" to 8" bores.

SPECIAL FEATURES

Included are detailed explanations of the many features which have made ORTMAN-MILLER cylinders standard in thousands of plants throughout the country. Detailed drawings and copy explain the special shear bar assembly which completely eliminates bulky end caps and tie rods, thus saving up to ⅓ in space. In addition, it shows the vast number of interchangeable mountings and applications which almost always eliminate the need for special castings or patterns. This feature alone not only saves initial costs, but cuts down on inventory and greatly speeds up delivery on every order.

Special Note:

14 DAY DELIVERY

Increased production facilities and standardization of parts continue to make possible delivery in 14 days or less on almost all orders for O-M cylinders. Write today for details.

FREE TEMPLATES

In addition to the FREE catalog, Ortman-Miller also leads the field in making available FREE TEMPLATES of all O-M cylinders. Prepared in half and quarter scale, they are extremely useful in design and application of O-M cylinders to your special requirements.

For your FREE Catalog or templates, use the coupon in the ad at the right. Or write to ORTMAN-MILLER Machine Co., 1216 150th St., Hammond, Indiana.

4 REASONS WHY YOU SHOULD USE O-M AIR, WATER & HYDRAULIC CYLINDERS

1 14 DAY DELIVERY

Complete standardization of interchangeable parts and elimination of need for special patterns and castings mean faster production, lower costs. Even the most difficult "custom" applications can almost always be made from O-M standard cylinders . . . without delay!

2 NO TIE-RODS, BOLTS or SCREWS!

New simplified design completely eliminates bulky end caps and tie rods, saves up to ⅓ in space. No bolts or screws. Special circumferential keys allow quick, easy installation, even faster repacking.

3 MACHINED STEEL, NO CASTINGS

All cylinder body parts are bar stock steel, made in automatic screw machines. No castings whatsoever. All bearing surfaces are bronze.

4 SAVE SPACE, TIME AND MONEY

O-M special features mean less inventory . . . increased uses from standard sizes. Interchangeable mounting brackets, ports adjustable to any angle. Full range of sizes from 1½" to 8" bores.

FULL DETAILS IN COLUMN AT LEFT

FREE!

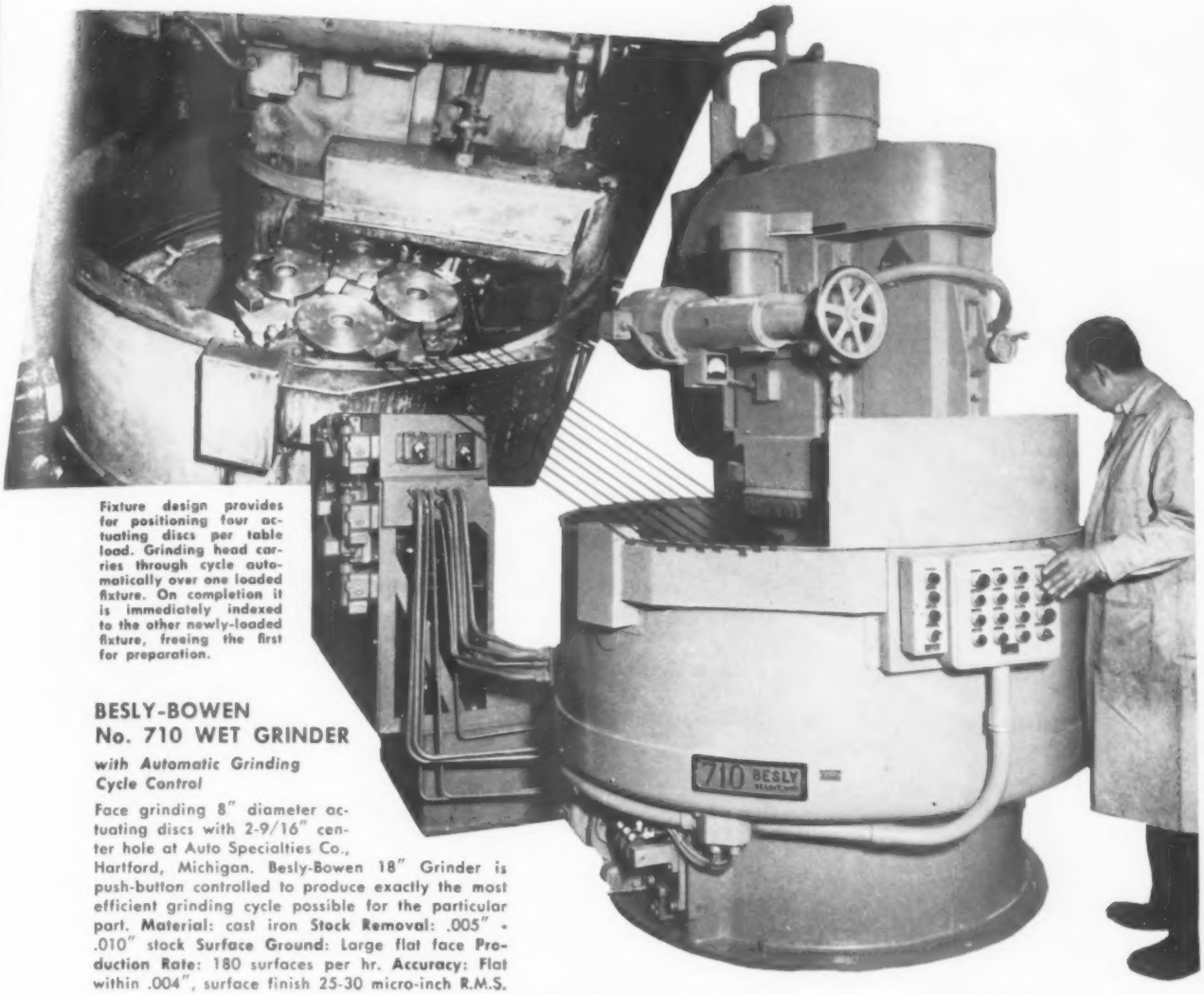
NEW CATALOG
Gives full details, data and specifications on all O-M cylinders. Standard, oversize & 2-1 piston rods.

TEMPLATES
Complete set of ½ or ¼ scale templates showing all cylinders and mounting brackets.

ORTMAN MILLER MACHINE CO.
1216 150TH ST
HAMMOND, INDIANA

Ortman Miller Machine Co.
1216 150th St., Hammond, Indiana
Please send me ____FREE CATALOG of O-M cylinders
____FREE SET of ½ scale templates
____FREE SET of ¼ scale templates

Name ..... Position .....
Company .....
Address .....
City ..... Zone .... State .....



Fixture design provides for positioning four actuating discs per table load. Grinding head carries through cycle automatically over one loaded fixture. On completion it is immediately indexed to the other newly-loaded fixture, freeing the first for preparation.

BESLY-BOWEN
No. 710 WET GRINDER
with Automatic Grinding Cycle Control

Face grinding 8" diameter actuating discs with 2-9/16" center hole at Auto Specialties Co., Hartford, Michigan. Besly-Bowen 18" Grinder is push-button controlled to produce exactly the most efficient grinding cycle possible for the particular part. **Material:** cast iron **Stock Removal:** .005" - .010" stock **Surface Ground:** Large flat face **Production Rate:** 180 surfaces per hr. **Accuracy:** Flat within .004", surface finish 25-30 micro-inch R.M.S.

No IDLE Machine Time

Many plants have accepted as unavoidable a grinding operation in which the operator merely stands by to supervise the grinding cycle, then busies himself while the machine is idle. Besly-Bowen Grinders bring to this situation a striking shrinkage in costs by using two rotary work tables: Over one the machine grinds *automatically* under control by the automatic cycling mechanism, while the operator works at the other unloading, cleaning, reloading. Result: continuous operation . . . no idle machine time . . . reasonable period for cleaning the fixture before re-loading thus reducing rework and scrap . . . non-intermittent working conditions and thus less pressure on the man.

This is only part of the success story on Besly-Bowen Grinders which also offer improved performance at these points: Positioning the work to the wheel is more accurate — Ample coolant directed to do the most good — Correct feed rate for most efficient stock removal. Whatever your grinding demands you should talk to the Besly representative in your territory, since the Besly Line covers all situations. But ask him specifically about the Besly-Bowen Radial Head Face Grinders. Meanwhile send the coupon below for advance literature to consider.

BESLY-BOWEN
GRINDERS
are Multi-Purpose Face Grinders and include models 3 horse power to 30 horse power, all available with Automatic Cycle Control.

BESLY-WELLES CORPORATION • Beloit, Wisconsin
Established as Charles H. Besly & Company in 1875

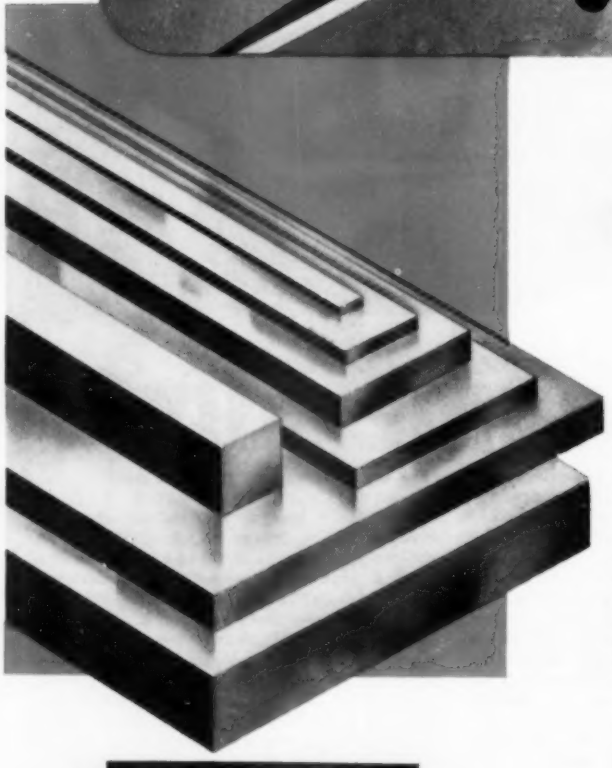
BESLY — BESLY Grinders, all types and sizes — Taps, Drills and Reamers by BESLY — BESLY
BESLY-TITAN Abrasive Wheels & Discs

Send This Coupon

Besly-Welles Corporation
118 DEARBORN
BELOIT, WISCONSIN

Please send us Besly Disc Grinder Booklet with detailed story of Besly-Bowen machines. Also (check here) have a representative call.

NAME_____
COMPANY_____ POSITION_____
ADDRESS_____
CITY_____ ZONE____ STATE_____



SIMONDS

Now Makes Both Types of Flat Ground DIE STEEL

Simonds offers you a choice of OIL or AIR Hardening DIE STEEL, whichever is best suited to your requirements. Both types are made from Simonds own steel, are precision ground to a thickness limit of plus or minus .001" and have an extra smooth surface finish of 25 to 35 micro inches. Edges and ends are square and parallel, with all scale, decarburation and surface defects removed. All sizes come individually packaged with heat treating instructions.

SIMONDS AIR HARDENING DIE STEEL

(non-deforming 5% Chrome Type) is spherodize annealed for good machinability and uniform hardenability. Its wide hardening range (1700° to 1800° F.) makes it practically foolproof in heat-treating. Stock sizes run from ½" to 2" thick and 2" to 10" wide in 36" lengths.

SIMONDS OIL HARDENING DIE STEEL

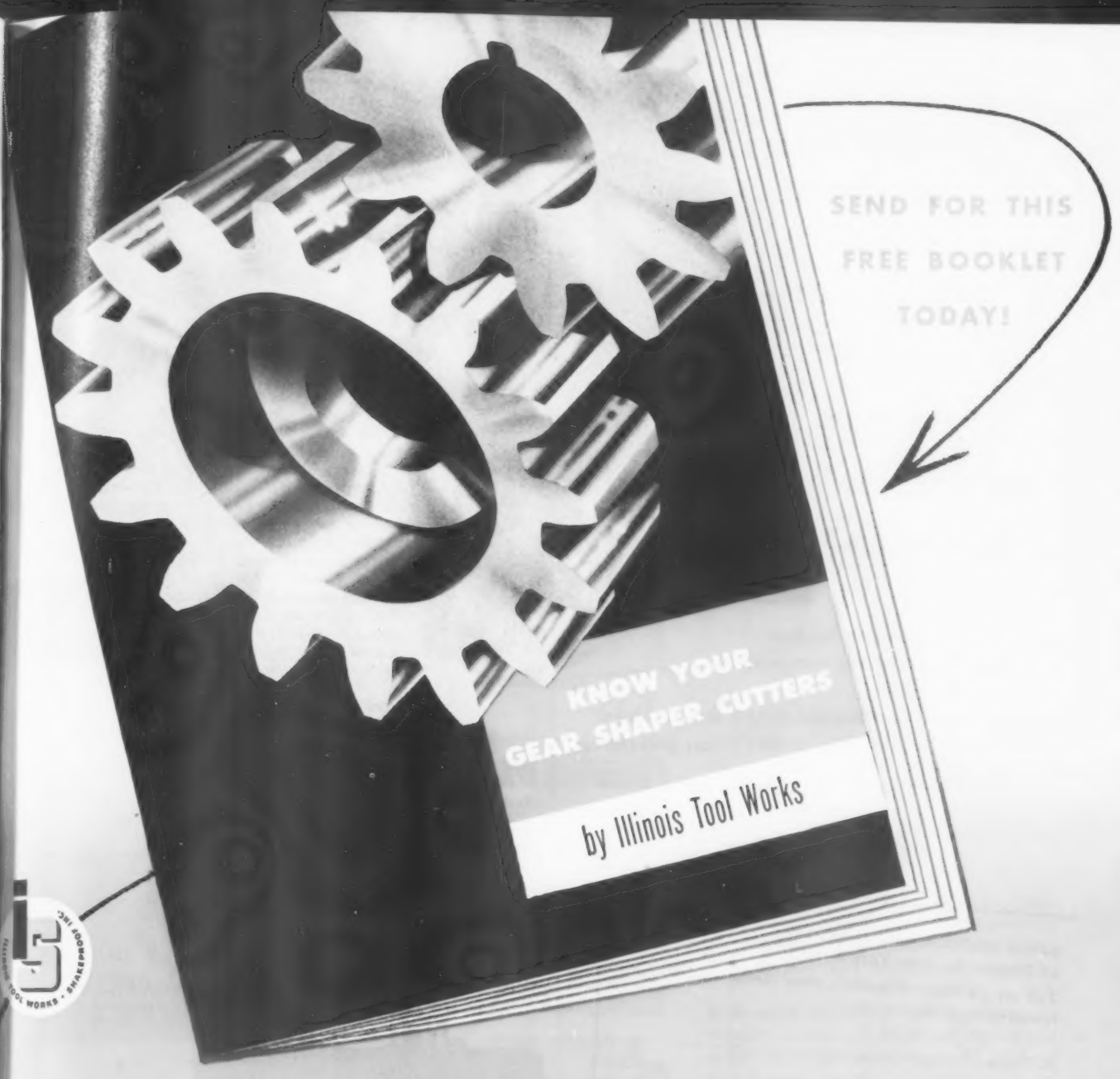
(non-deforming Molybdenum Type) is uniformly annealed for easy machining and uniform hardening. Due to its wide hardening range (1450° to 1540°) good results are assured with even the simplest heat treating equipment. Stock sizes are available from 1/64" to 3" thick and ⅛" to 14" wide in 18" lengths. The heavier sizes also come in 36" lengths

Try a bar on your next job. Your Simonds Distributor carries many sizes of both types in stock — call him right now.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon.
Canadian Factory in Montreal, Que.
Southern Service Shop in Meridian, Miss. (formerly J. H. Minor Saw Mfg. Co.)
Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.,
Simonds Abrasive Co., Phila., Pa. and Arvida, Que., Canada



take a new look at your Gear Shaper Cutters!

SEE HOW TO INCREASE GEAR PRODUCTION AND DECREASE TOOL COSTS!

ILLINOIS

TOOL WORKS

Understand the real function of the gear shaper cutters you use—their broad range of application and how their cutting life can be extended. Check the advantages of cutter design modifications in meeting special gear requirements. See how specific engineering of gear shaper cutters can be important in your cost picture!

For longer life, in mass production or job lots, specify ILLINOIS engineered Gear Shaper Cutters!

Illinois Tool Works, 2501 No. Keeler Avenue, Chicago 39, Ill.

"HEADQUARTERS FOR ENGINEERED CUTTING TOOLS"

9 design problems that can be met with the... Allenut

Ever-increasing applications for the new ALLENUT have caused sales to double within the past two years. Here are some of the things it can do to aid your product designing:

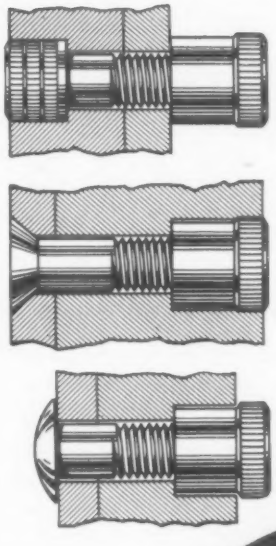
1. Self-anchoring in any metal. Allenut provides positive anchoring action through its hardened knurls.

2. Compact design. Requires no space for box wrenching. 12-point socket permits tightening in awkward places.

3. Smooth surfaces. Fits flush or below surface in counterbored hole . . . permits streamlined, safe surfaces.

4. A ready-made, hardened, tapped hole. When used as a bushing, prevents costly stripping of threads caused by frequent removal and replacement of screw or bolt. In castings and other soft metals a stripped hole can be counterbored, an Allenut inserted and the same bolt or screw used.

5. Tighter fit. Greater thread contact than with ordinary nuts because of Class 3 fit. Weld-like setups accomplished with one hand wrenching. Allenut holds firm against turn of screw.



6. Usable with any type of bolt or screw. Permits space-saving, internal wrenching of cap screws, T bolts, machine bolts, and other common fasteners.

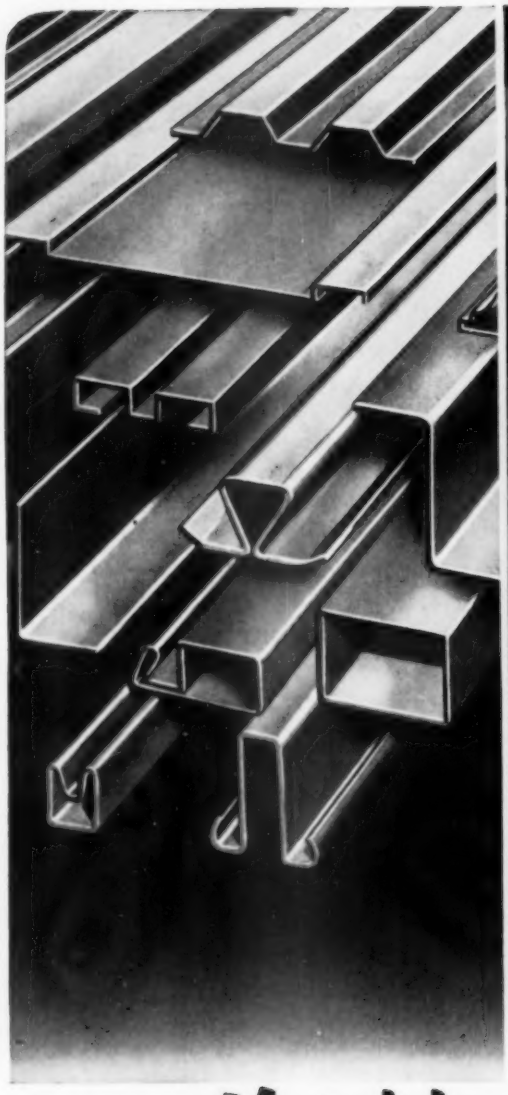
7. Saves parts. No washers required when anchored.

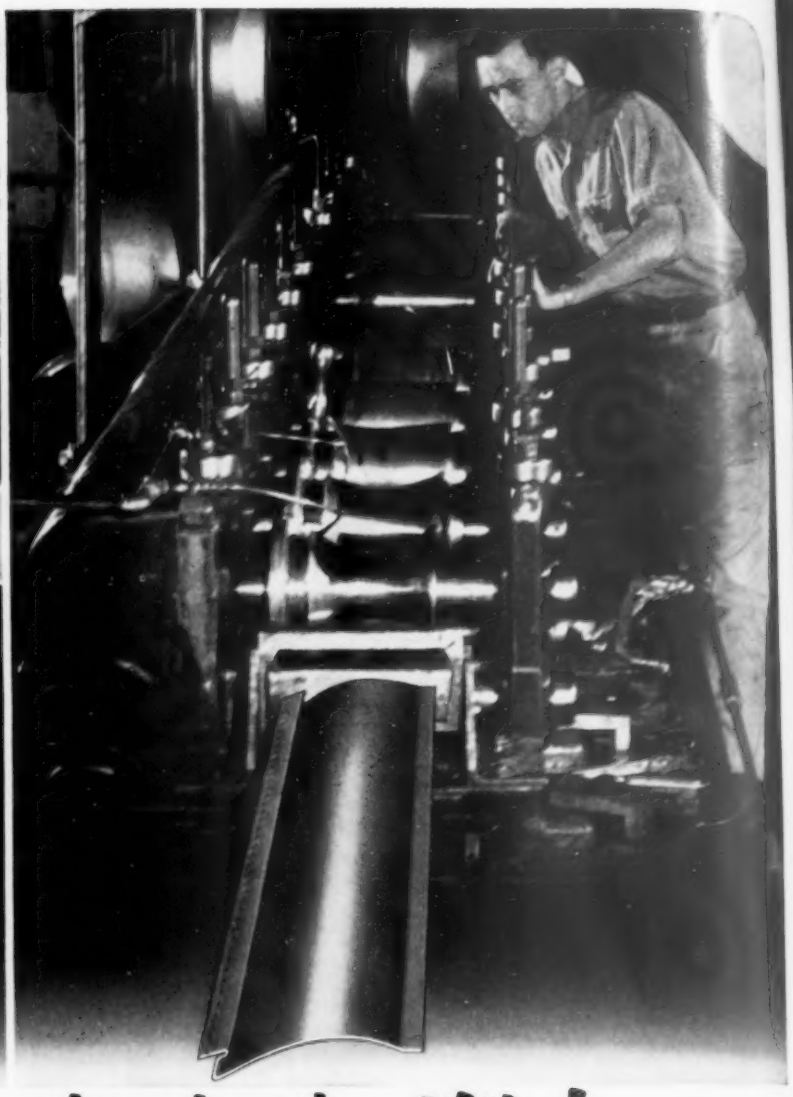
8. Easier to use. Knurled ring facilitates fingering-in. Allenut is always square to counterbored hole. Removable by hitting screw or bolt head with tap of a hammer.

9. Reusable indefinitely. Anchoring action remains unimpaired. Hardened threads and socket stand up under repeated removal and replacement.

Allenuts are available in a full range of 14 standard sizes from no. 4 to 1" from leading industrial distributors.

We welcome your inquiry and request for engineering details on Allenut applications.





Metal Lumber by the Mile!

Not only rough but finished "lumber," mouldings and trim, are made in an endless stream on a Yoder Cold Roll Forming machine, from coiled metal strip.

The photo shows the production of siding by Kaiser Aluminum and Chemical Corporation, Oakland, Calif. The strip goes in at one end, is perforated and formed, coming out at the other as finished siding, automatically cut to length, ready for installation.

As a matter of fact, almost anything that can be made from lumber can now be made more accurately, better and more cheaply from metal, by this method. Plain steel angles, channels and Z's up to ½" thick, take the place of conventional framing lumber. More intricate shapes, combining structural strength with decorative value, serve for mouldings, panels and trim.

Billions of feet are now made annually on Yoder machines, owned by manufacturers of buildings and their components, furniture, electric appliances, automotive equipment, etc.

Yoder book on the function, scope and economics of Cold Roll Forming, sent on request. Consultations and estimates for the asking.

THE YODER COMPANY • 5525 Walworth Ave., Cleveland 2, Ohio

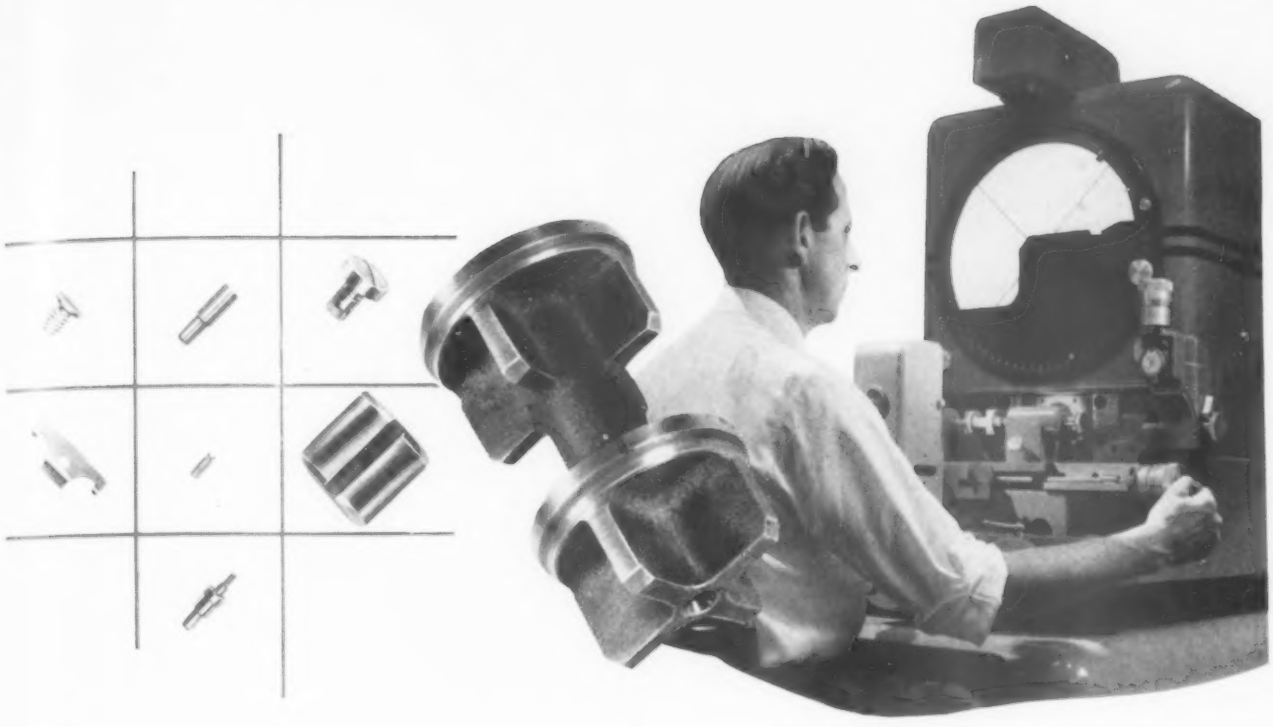
Complete Production Lines

- ★ COLD-ROLL-FORMING and auxiliary machinery
- ★ GANG SLITTING LINES for Coils and Sheets
- ★ PIPE and TUBE MILLS–cold forming and welding

ENGINEERING YODER MANUFACTURING

TAP DRILL SIZES and BASIC THREAD DIMENSIONS

NOMINAL SIZE	MAJOR DIAM. INCHES (BASIC)	PITCH DIAM. INCHES (BASIC)	ROOT DIAM. INCHES (BASIC)	COML. TAP DRILL TO PRODUCE APPROX. 75% FULL THREAD	DECIMAL EQUIV. OF TAP DRILL	MACHINE SCREW NO.	MAJOR DIAM. INCHES (BASIC)	PITCH DIAM. INCHES (BASIC)	ROOT DIAM. INCHES (BASIC)	COML. TAP DRILL TO PRODUCE APPROX. 75% FULL THREAD	DECIMAL EQUIV. OF TAP DRILL
1/4–20	.2500	.2175	.1850	7	.2010						
1/4–28	.2500	.2268	.2036	3	.2130	0–80	.0600	.0519	.0438	3/64	.0469
5/16–18	.3125	.2764	.2403	F	.2570	1–64	.0730	.0629	.0527	53	.0595
5/16–24	.3125	.2854	.2584	I	.2720	1–72	.0730	.0640	.0550	53	.0595
3/8–16	.3750	.3344	.2938	5/16	.3125	2–56	.0860	.0744	.0628	50	.0700
3/8–24	.3750	.3479	.3209	Q	.3320	2–64	.0860	.0759	.0657	50	.0700
7/16–14	.4375	.3911	.3447	U	.3680	3–48	.0990	.0855	.0719	47	.0785
7/16–20	.4375	.4050	.3726	25/64	.3906	3–56	.0990	.0874	.0758	45	.0820
1/2–13	.5000	.4500	.4001	27/64	.4219	4–40	.1120	.0958	.0795	43	.0890
1/2–20	.5000	.4675	.4351	29/64	.4531	4–48	.1120	.0985	.0849	42	.0935
9/16–12	.5625	.5084	.4542	31/64	.4844	5–40	.1250	.1088	.0925	38	.1015
9/16–18	.5625	.5264	.4903	33/64	.5156	5–44	.1250	.1102	.0955	37	.1040
5/8–11	.6250	.5660	.5069	17/32	.5312	6–32	.1380	.1177	.0974	36	.1065
5/8–18	.6250	.5889	.5528	37/64	.5781	6–40	.1380	.1218	.1055	33	.1130
3/4–10	.7500	.6850	.6201	21/32	.6562	8–32	.1640	.1437	.1234	29	.1360
3/4–16	.7500	.7094	.6688	11/16	.6875	8–36	.1640	.1460	.1279	29	.1360
7/8– 9	.8750	.8028	.7307	49/64	.7656	10–24	.1900	.1629	.1359	25	.1495
7/8–14	.8750	.8286	.7822	13/16	.8125	10–32	.1900	.1697	.1494	21	.1590
1 – 8	1.0000	.9188	.8376	7/8	.8750	12–24	.2160	.1889	.1619	16	.1770
1 –14	1.0000	.9536	.9072	15/16	.9375	12–28	.2160	.1928	.1696	14	.1820
1 1/8– 7	1.1250	1.0322	.9394	63/64	.9844	14–20	.2420	.2095	.1770	10	.1935
1 1/8–12	1.1250	1.0709	1.0168	1 3/64	1.0469	14–24	.2420	.2149	.1879	7	.2010
1 1/4– 7	1.2500	1.1572	1.0644	1 7/64	1.1094						
1 1/4–12	1.2500	1.1959	1.1418	1 11/64	1.1719						
1 3/8– 6	1.3750	1.2667	1.1585	1 7/32	1.2187						
1 3/8–12	1.3750	1.3209	1.2668	1 19/64	1.2969						
1 1/2– 6	1.5000	1.3917	1.2835	1 11/32	1.3437						
1 1/2–12	1.5000	1.4459	1.3918	1 27/64	1.4219						



These parts help give Weston instruments their accuracy... they're checked on Kodak Contour Projectors

There is such a great variety of Weston instruments to measure all sorts of variables in all sorts of ranges that production on most individual items is small.

This creates a parts inspection problem. Precision requirements in many cases are so stringent that any measurable deviation from specifications is too big. Setting up toolroom instruments takes too long for the small volume of work being checked at any one time. Mechanical gages are even less economical at the low volume levels, and they just did not give the required accuracy on such jobs as checking the shoulder angles, concentricities, and specifications of the double-acting valve body shown above. (It goes in a recording thermometer and Weston makes it in many different sizes.)

Now Weston has converted to Kodak Contour Projectors. An inspector merely picks up the specification sheet covering a given part, gets the chart gage indicated there, puts it on the screen of the projector, and proceeds to sample according to specifications. Often, as with the valve body, gage blocks are used to step off the traverse of the projector work table. The inspector notes whether a shadow image coincides with a chart line after the table has carried it by the specified distance.

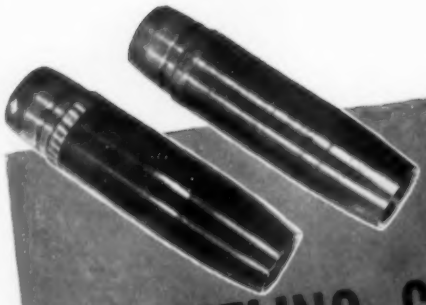
Possibly your inspection problems are volume and speed rather than the flexibility that Weston wants. In that case you will want to know about the Kodak Contour Projector, Model 3, which is designed for use with special staging fixtures instead of a moving work table. There is a field engineer in your area who can show you which model best fits your problem. To get in touch with him, just drop a note to *Eastman Kodak Company,* Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak
TRADE-MARK



BROACHING RIFLING GROOVES ON RECOILLESS SHELLS the *American* way

Parts are ma ally loaded and autom ally ejected for high p duction. Operator ply loads and star the machine. Machine uto-matically reverses fter down stroke.

The machine, fixture and broaches to broach the rifling grooves on recoilless shells are all American-engineered — typical example of complete American engineering from start to finish.

The MACHINE

A special T-10-36 American 3-Way — designed for the push down broaching of the shells past stationary broaches. The machine is equipped with dual electrical controls and is also arranged to allow the broached shell to eject automatically out the right hand side of the machine.

The FIXTURE

American engineers designed the lead bar attachment with driving lugs which contact the shell during the push down operation causing the shell to rotate during the broaching stroke.

The BROACHES

Individual cutters mounted in a pot incorporating the proper broach design to provide a free cutting operation as the shell is pushed through. These individual cutters can be easily removed for resharpening and replacement.

You can benefit from the American-Way when you want high production at low unit cost. Send a part print or sample for the recommendations of the company that *engineers and builds all three*—broaching machines, broaches and broaching fixtures. Write today. Address Dept. **T.**

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

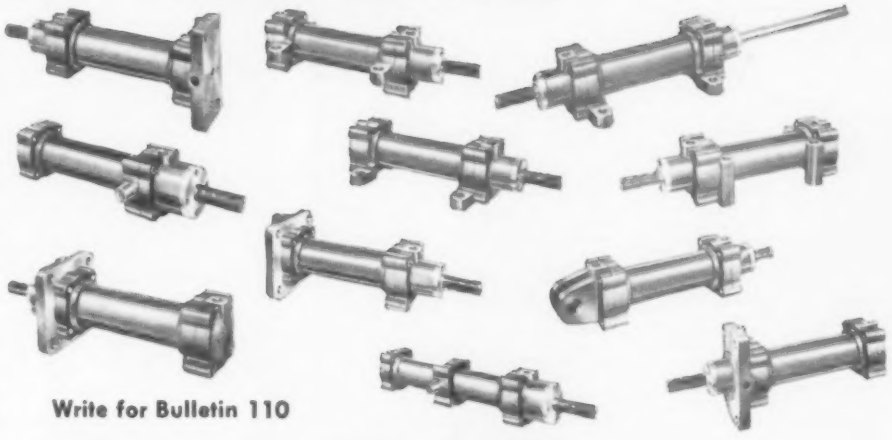
SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

FOR YOUR

SERIES "N" HYDRAULIC CYLINDERS

- Long recognized as the finest hydraulic cylinder made.
- No tie rods; ideal for long-stroke applications
- 12 bore sizes, 1" to 8"
- 11 mounting styles; many combination mountings available

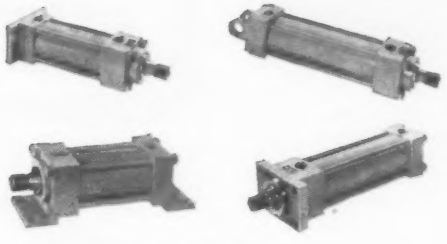


Write for Bulletin 110

HYDRAULIC

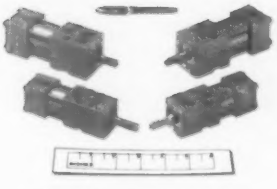
New HANNIFIN "Space Saver" HYDRAULIC CYLINDERS

- Here is a square-type cylinder built to Hannifin's exacting standards
- Especially designed to meet the needs of machine tool builders



Write for Bulletin 111

Series SS—9 Bore Sizes, 1½" to 6" Four popular mounting styles, rugged construction, for pressures to 2,000 p.s.i.

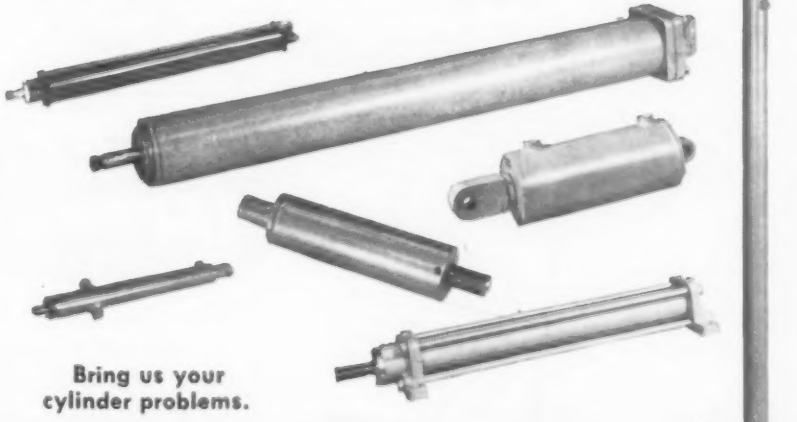


Type U—Pressures to 1000 P.S.I. 1", 1¼", 1½" Bores—Ideal for jig and fixture work. Write for Bulletin 112

CYLINDERS

HANNIFIN "CUSTOM" HYDRAULIC CYLINDERS

- Built in quantity for use on customers' products
- Specially designed for each application
- Often the most economical way to buy hydraulic cylinders



Bring us your cylinder problems.

HANNIFIN

Hannifin Corporation, 1119 Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

CLEEREMAN JIG BORERS

Precision—

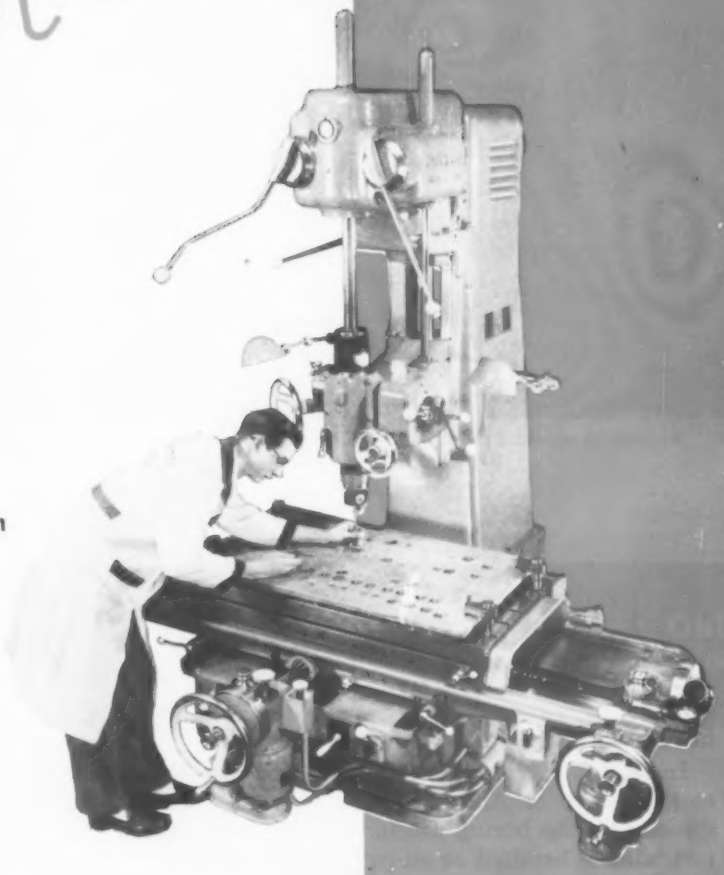
by

CLEEREMAN

. . . for ultra-fine tolerances on highest quality gage, tool, die, jig and fixture work—and on "jigless" production

. . . to stand the gaff in today's high pressure tool room and production plant service

. . . for higher profits and higher output through the ultimate in operating ease and efficiency



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Representatives in Principal Cities

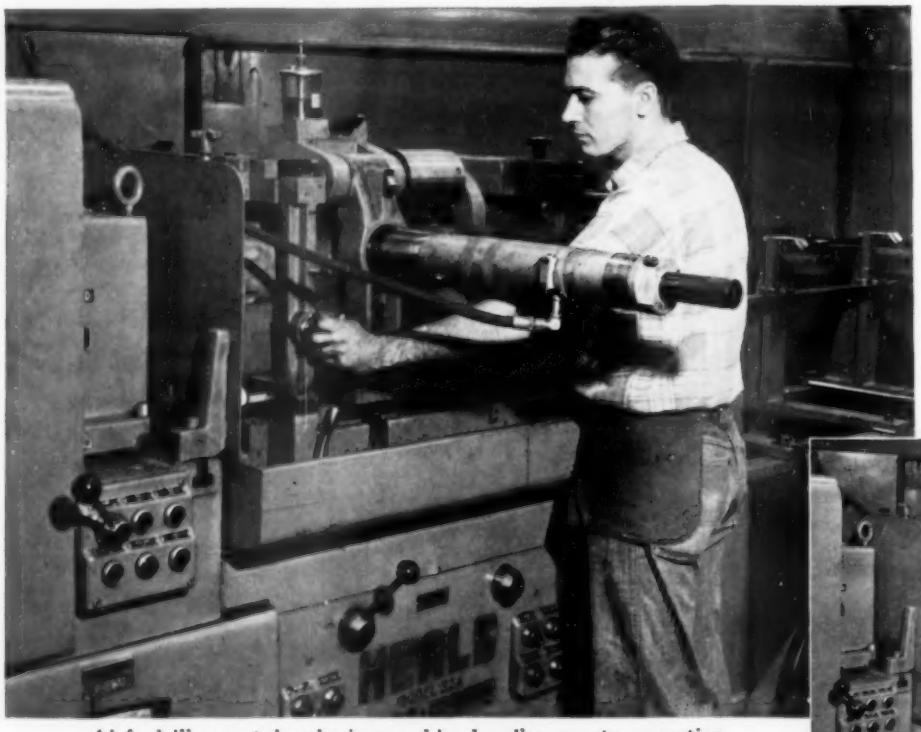
AFFILIATED WITH

CLEEREMAN MACHINE TOOL CO. Green Bay, Wisconsin

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

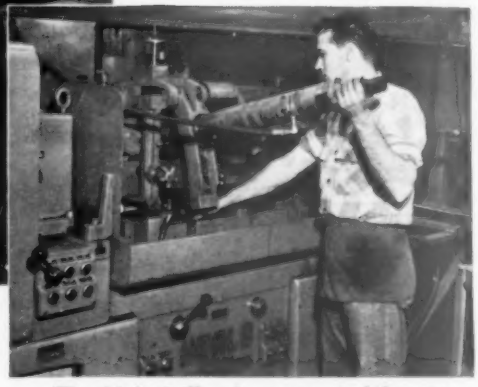
Handles two jobs with one setup...

bores and counterbores camshaft housings in a single operation



Airfeedrill mounted on boring machine handles an extra operation without changing the setup.

Clever Fellows . . . these hole engineers! Their ingenuity seems to know no bounds. We scarcely suspected that Airfeedrills could be used so many ways—for so many different purposes—until hole engineers began figuring what they could do with them. Here is another instance.



The Airfeedrill swings up out of the way while the machine is loaded.

To counterbore a pad on camshaft housings by conventional methods would have required a farm equipment manufacturer to invest $2,500 in an extra machine plus $1,200 for a fixture—total $3,700. The machine would have needed 28 sq ft of valuable floor space.

Instead, a clever hole engineer rigged a device so that a Keller Airfeedrill could be mounted directly on the boring machine. Thus the counterboring is handled as an extra operation during the regular boring cycle.

This arrangement saved most of the $3,700 investment as well as 28 sq ft of floor area. Even more important, it saves extra handling and setup time for every camshaft that is bored, making a substantial saving in machining costs.

Perhaps you have a spot where Keller Airfeedrills can provide an additional operation, or help bring obsolescent machines up to date. Discuss it with a Keller application engineer.

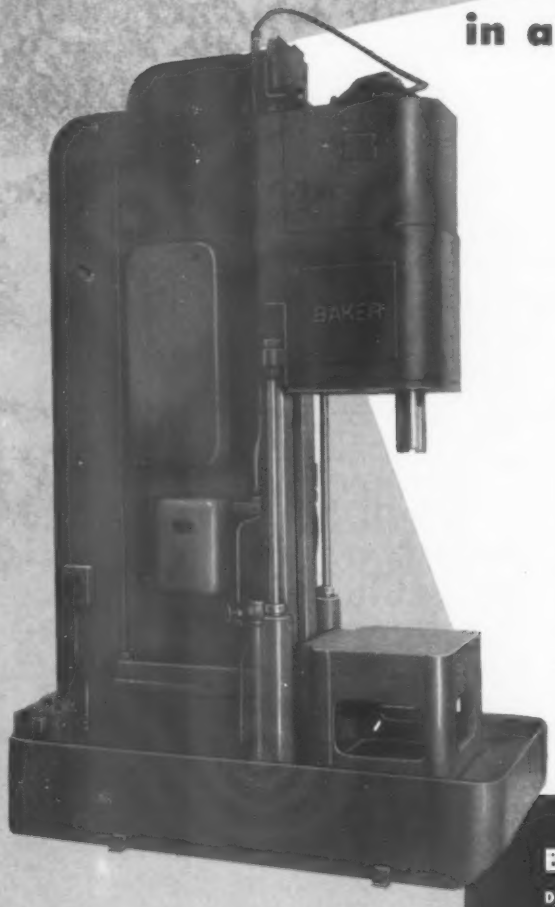
KELLER *Pneumatic Tools*

KELLER TOOL COMPANY
GRAND HAVEN, MICH.

BAKER

The Versatile BAKER 36HO DRILL...

provides increased productivity in a multitude of applications!



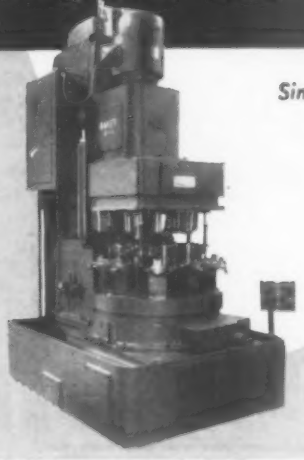
The standard Baker 36HO Heavy Duty Vertical Hydraulic Drill may be adapted to a multitude of multiple or single spindle drilling, boring, counterboring, spot facing or reaming operations. Provision for pick-off speed changeovers gives extreme flexibility of spindle speeds. The machine is of hydraulic saddle type feed and may be furnished with either standard plain table or indexing table with up to six indexing stations. Ample capacity is provided to drive one 5 inch diameter High Speed twist drill, drilling from solid in SAE-1035 steel. Write Baker concerning your specific job problem.

BAKER BROTHERS, INC., Toledo, Ohio

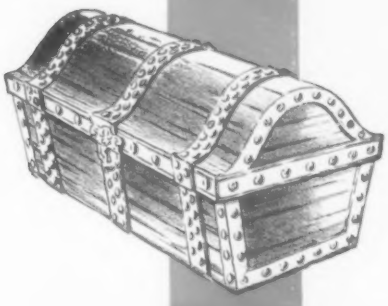
DRILLING . . . TAPPING . . . KEYSEATING and CONTOUR GRINDING MACHINES

Illustrations show Baker 36HO as adapted for drilling wrench bodies for a leading manufacturer of crescent wrenches. Estimated production rate is 103 parts per hour at 100 % efficiency. Machine is easily converted for operations on varying sizes of wrenches.

Since 1867...



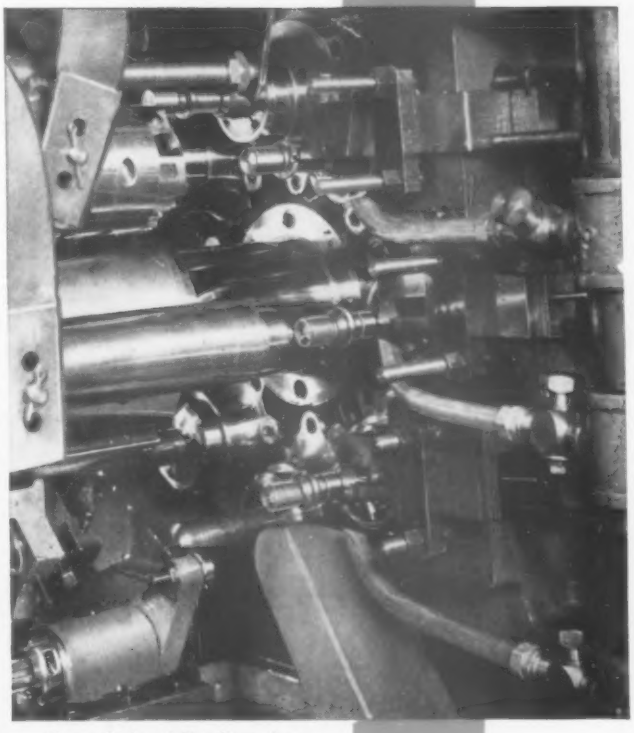
ECES FROM EIGHTS



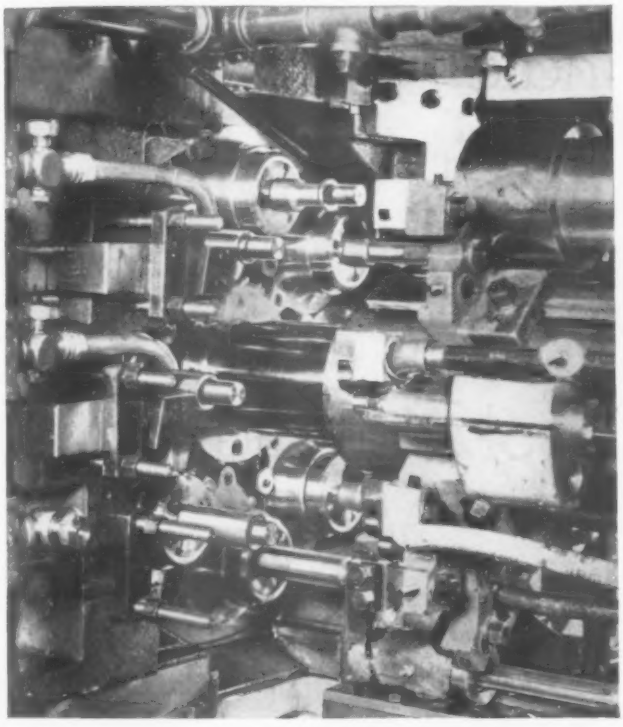
The first eight spindle bar automatics were introduced in 1930 by the late Frank L. Cone, founder of the Cone Company.

CONOMATIC Eights have had the usual opportunities available to any production tools that can handle added requirements and responsibilities.

With more tool positions than other "automatics", Eight Spindle CONOMATICS have an advantage in taking on, at one chucking, operations that save the costs of second handling.

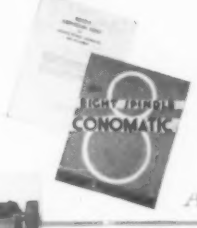


Rear Side of Tooling Area



Front Side of Tooling Area

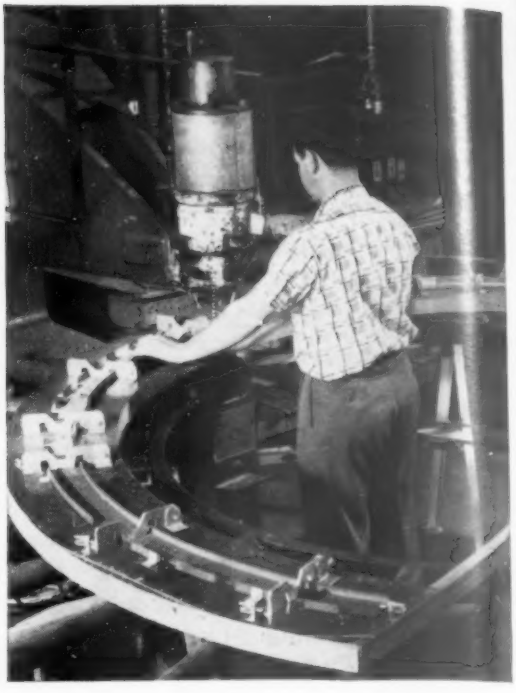
The milling and stamping operations performed by the 1⅝-EIGHT, on the piece shown, did not require stopping the spindle. The dependable performance of CONOMATICS makes such money-saving operations well worthwhile.



A Comparison of ALL Automatics is in favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.



Jigs and Fixtures are easier to machine – easier to handle when made of **Aluminum.** Investigate the **Substantial Savings** possible with **Alcoa** Tool and Jig Plate.*

- Moderately priced.
- Strain relieved—machined both sides.
- Tolerances on plates of thicknesses from ½" to 4" held within ± .010".
- Cut to any desired dimensions up to 48" x 96". Immediate delivery.

**For more information on Alcoa Tool and Jig Plate, contact your local Alcoa sales office... or write ALUMINUM COMPANY OF AMERICA, 1952-L Gulf Building, Pittsburgh 19, Pa.*

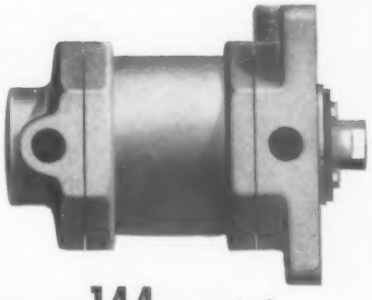
ALCOA

TOOL AND JIG PLATE

RIVETT furnishes a COMPLETE PACKAGE of Air and Hydraulic power

Hydraulic Cylinders — 108 models

Available for 300 P.S.I. and 1500 P.S.I. in standard models. 3000 P.S.I. and higher furnished on application. Offered in seven mounting styles, ten bore diameters, any length of stroke up to 96", standard size piston rod and 2:1 over-size rod, single and double end rods, cushioned rod end, blind end, or both. Special covers supplied. Write for Catalog 105.



Hydraulic Valves — 144 models

Designed for 1500 P.S.I. maximum pressure, and offered for 3000 P.S.I. in most models. Four types of action: standard, spring-return, spring-centered and ball-detent. Five piston designs for any circuit. Six types of operation: hand, foot, cam, solenoid, oil pressure, and air pressure. Seven sizes: ¼", ⅜", ½", ¾", 1", 1¼", and 1½". Write for Catalog 203.

Hydraulic Power Units — 17 models

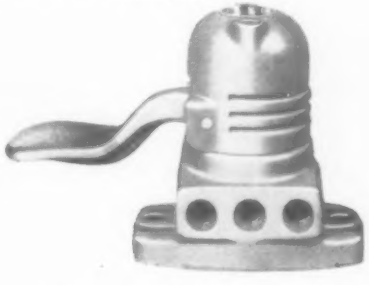
Single pump power units are offered in six tank sizes. Pump capacities range from .4 G.P.M. to 40 G.P.M. at 1000 P.S.I. Double pump power units are offered in four tank sizes with combined pump capacities ranging from 3.5 G.P.M. to 48 G.P.M. at 1000 P.S.I. 1200 P.S.I. continuous or 1500 P.S.I. intermittent pressures are available in certain models. Write for Catalog 400.

Air Cylinders — 84 models

Available for 150 P.S.I. air and 300 P.S.I. oil services. Standard models offered in seven mounting styles, nine bore diameters, in any length stroke up to 96", single or double end rod with internal or external thread, cushioned rod end, blind end, or both. Special covers supplied. Write for Catalog 55.

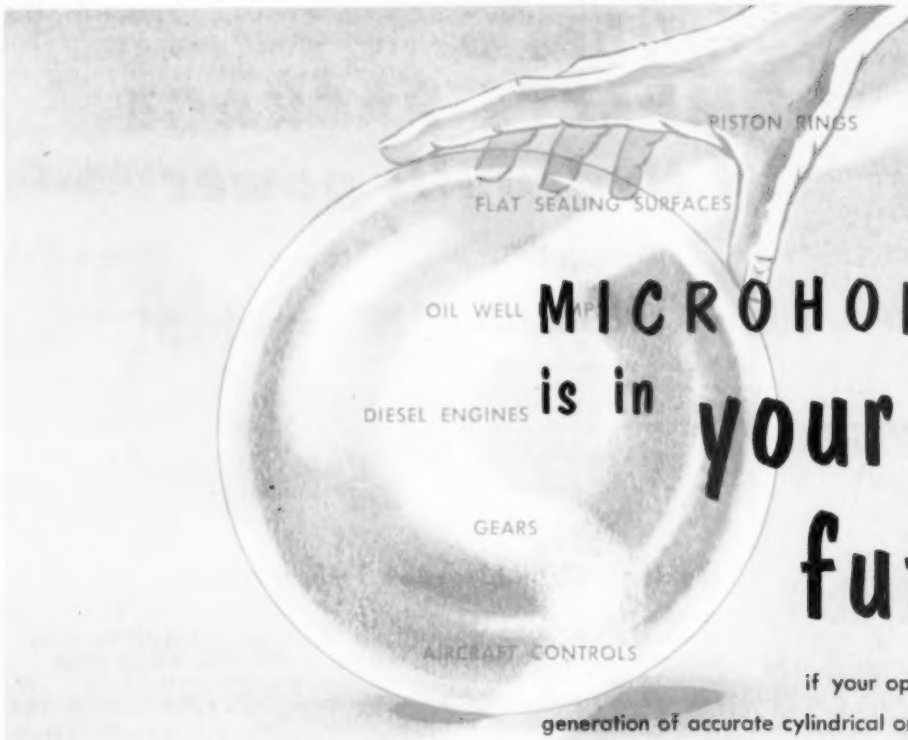
Air Valves — 34 models

Designed for control of air pressures up to 150 P.S.I. Offered in both 3-way and 4-way types. Available in five types of operation: hand, foot, cam, solenoid, and pilot operations; in five sizes: ¼", ⅜", ½", ¾" and 1". Pilot air valves in side and foot mountings—and in palm, push button, cam, foot, and solenoid operation. Write for catalog 303.



Dept. TE-11, RIVETT LATHE & GRINDER, Inc. Brighton 35, Boston, Massachusetts

WHEN YOU APPLY HYDRAULIC OR AIR POWER *Plan with* RIVETT



MICROHONING is in your future

if your operation requires the generation of accurate cylindrical or flat surfaces.

Hundreds of industrial plants have found that Microhoning not only improves the quality of the surface, but also increases production—reduces scrap, handling, and inspection costs.

No, you do not need a crystal ball.

The potentials of the Microhoning process can best be judged by the past accomplishments and present policy of the organization that developed it.

To give industry a complete service, the Micromatic Hone Corporation has an organization and sales policy unique in the machine-tool business. One well-coordinated organization sells, engineers, builds, and services the complete installation. Micromatic assumes full responsibility for all the equipment and the results obtained with the Microhoning process.

MICROMATIC HONE CORPORATION · DETROIT

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Guilford, Connecticut

MICROMATIC HONE CORP.
614 Empire Building
26 So. Main Street
Rockford, Illinois

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

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MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

Faster production at lower cost

MODERN COLLAPSIBLE TAPS

New

FOR EITHER STATIONARY OR ROTARY USE

- Easy and quick adjustment. No special tools required.
- Interchangeable shank for convenience in changing from one machine to another.
- Thread length setting undisturbed by diametrical adjustment.
- Extra rigidity with unusually sensitive collapse.
- Simple in design. No complicated mechanisms.
- Heavy chasers for greater strength. Chaser threads precision ground.
- All parts hardened and ground and precision fitted.

Modern Precision Tools Include . . . . .

STATIONARY SELF-OPENING DIE HEADS
ROTARY SELF-OPENING DIE HEADS
STATIONARY COLLAPSIBLE TAPS
ROTARY COLLAPSIBLE TAPS
MODERN-MAGIC CHUCKS AND COLLETS
SELF-OPENING STUD SETTERS
INSERTED BLADE FACE MILLING CUTTERS
SOLID ADJUSTABLE DIE HEADS
ADJUSTABLE HOLLOW MILLING TOOLS
UNIVERSAL CHASER GRINDING FIXTURES

Send for full information on this new improved Modern Collapsible Top and its cost reducing possibilities applicable to your tapping

MODERN TOOL WORKS

DIVISION

CONSOLIDATED MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

DoALL MICRO-STEP GAGING SYSTEM

HERE, for the first time is the means for directly applying gage blocks to thousands of precision measurement jobs which previously could be checked only with less accurate gaging setups.

—the means for securing micro-inch accuracy on *inside* as well as outside measurements.

—the means for assembling *gage-block* gages of every conceivable type, including gages up to 72″ long.

—the means for making pin gages, snap gages, indicating gages, height gages, depth gages, go and no-go gages for use not only in the lab, but in the toolroom and shop as well.

Here, in short, is a practical, economical means of securing superior dimensional quality control, of reducing rejects and wasted time, material and money.

Key to the system are the new DoALL Gage Holders and gage block-accurate End Standards with full exposed measuring surfaces. No other gage system offers such a combination.

For complete details, call your local DoALL Sales-Service Store, or write:

THE DoALL COMPANY

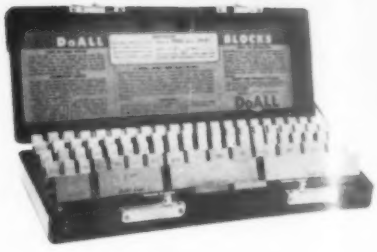
254 N. Laurel Ave., Des Plaines, Illinois

DoALL

ASK FOR NEW CATALOG

New Catalog describes the DoALL Micro-Step Gaging System in detail, lists all gage block, end standard and holder sets. Free on request.

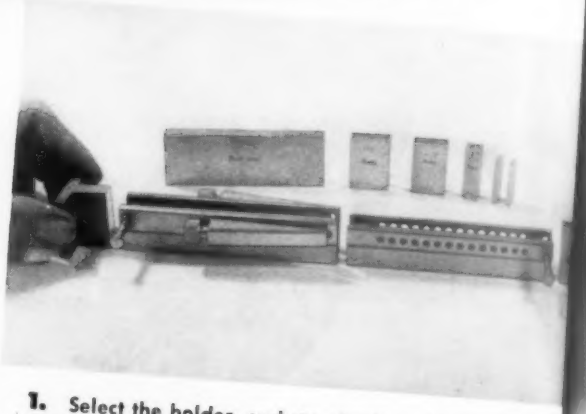
WITH THESE COMPONENTS . . .



DoALL BLOCKS

Accuracy second to none in the world. Most complete line of sets available, 6 to 118 pieces, including a new set having gage blocks up to 20.000″ long.

QUICKLY ASSEMBLED LIKE THIS . . .



1. Select the holder, end standards and gage block combination for any gage you need.

YOU MAKE GAGES LIKE THESE . . .

Internal gage-block gage calibrating indicating snap gage.

Assembled height gage for checking milling cutter setting.

Height gage with scriber end standard for layout work.

GB-13

Monolite

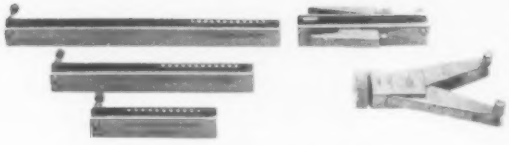
Optical Flats

Vernier Gage Blocks

Sine Bars and Plates

NEW DoALL END STANDARDS

Here are gage block-accurate End Standards with fully exposed measuring surfaces which, when used with DoALL Gage Holders, make possible gage-block gages for every internal or external measuring job.

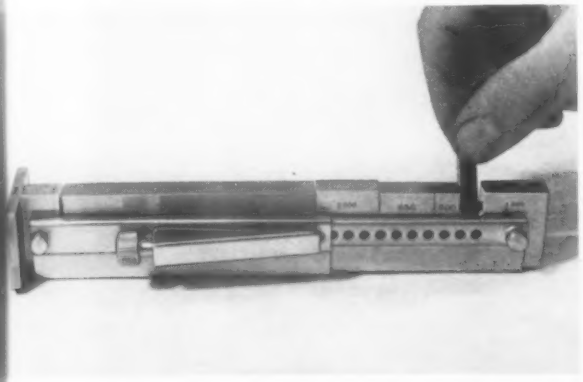


NEW DoALL GAGE HOLDERS

Channel-type holders available for making gages from 2″ to 72″ length. Quickly, easily assembled. Also a caliper holder for gages up to 6″. For use only with DoALL End Standards and standard rectangular gage blocks.

NEW DoALL DIAL INDICATOR ASSEMBLIES

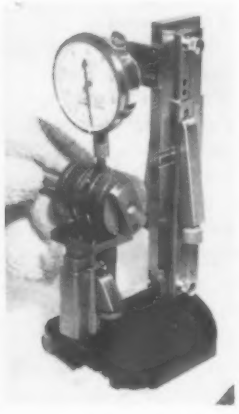
Here is the means of mounting dial indicators in any desired position in a DoALL Gage Holder to make indicating gages of all kinds.



2. Assemble holder, snap detent pins through end standards and insert correct gage block combination.

3. Press clamps into channel holes and tighten thumb screws snugly. That is all there is to it.

ternal indicating gage checking rts in the shop.



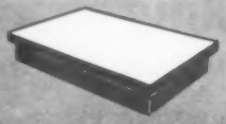
Pre-calibrated indicating comparator made with DoALL parts.

Micro-inch accurate indicating snap gage in use in the shop.

Go and no-go gage assembled with Micro-Step components.

This millionths-accurate indicating height gage is six feet long!

tric Comparators



Granite Surface Plates

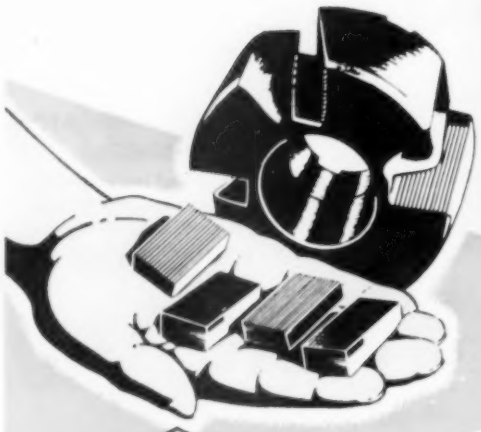
Mobile Inspection Unit

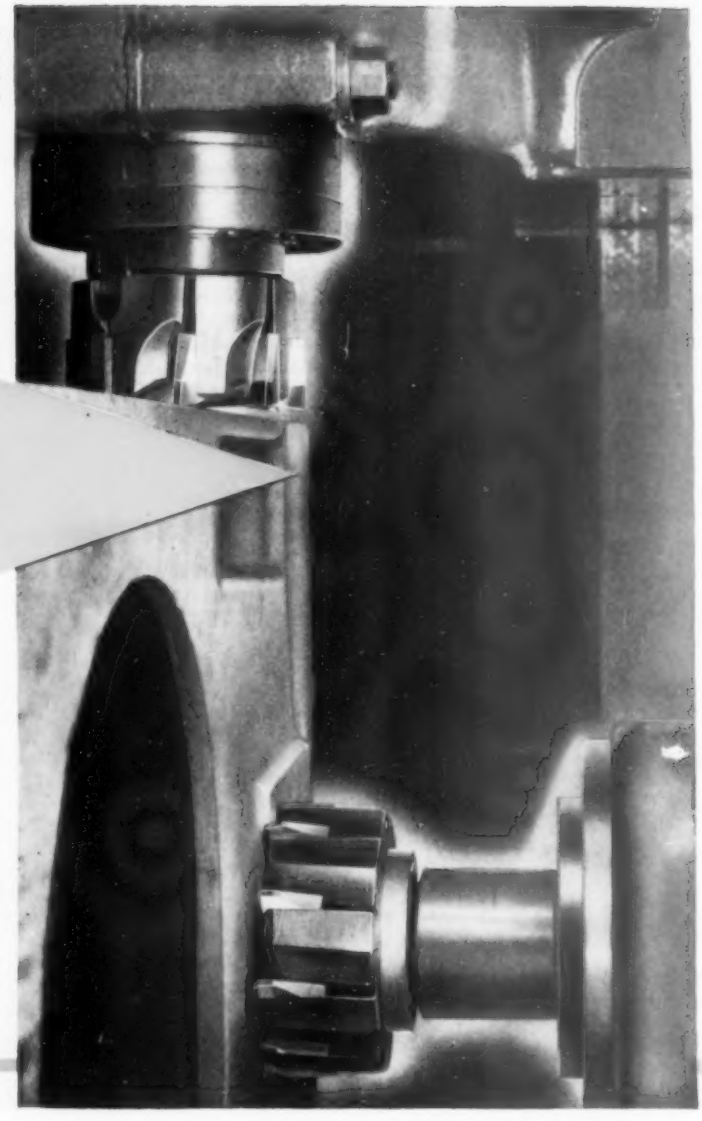
Gage Calibration Service

Gage Height Tables

Precision Measurement Text

48 in. Gray Planer-Miller
equipped with OK Carbide End and Face Mills
for milling top and side of heavy
cast iron machine frame





OK

carbide cutters for faster metal removal

Authorities agree that rigidity is the prime essential in carbide milling. Adequate support of carbide tips and cutting edges is the first consideration, because the transverse rupture strength of available carbide cutting materials is relatively low. Two means should be used to provide adequate support: First, a cutter body substantial in size and strength, and second, bodies so designed that substantial support extends as close to the cutting edges as is practical, considering chip clearance and clearance for diamond grinding wheels.

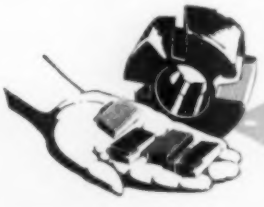
OK carbide milling cutters do provide substantial support in all necessary ways. The body is of heat-treated drop-forged steel and is of a design to support the blades close behind the cutting edges. The blades are of alloy steel with carbide tips brazed carefully into machined recesses in such a manner as to harden the blade.

Blade slots in the body are tapered, one side of the slot being flat, the other serrated. When the serrated wedge-shaped blades are driven into their respective slots in the body, the matching serrations prevent any lateral movement. No pins, screws, clamps or other holding devices are needed.

OK Carbide Milling Cutters are of the Dual Adjustable type. Three angles govern location of the blade in the body: the axial and radial rake angles and **the angle at which the blade is inclined toward the face of the cutter.** This combination saves you money and grinding time.

For when worn blades are advanced outward in the body by one serration, the ratio of radial to axial movement is about 4:1. This proportion is in accordance with our experience with wear of milling-cutter blades on medium and heavy-duty applications. Thus, most of regrinding is done along the side of the carbide insert which takes the maximum wear, thereby extending its useful life.

For complete details of OK Carbide Milling Cutters for milling cast-iron, steel and non-ferrous materials, write for a copy of Catalog 13, "OK Modern Milling Cutters for Modern Milling Machines."

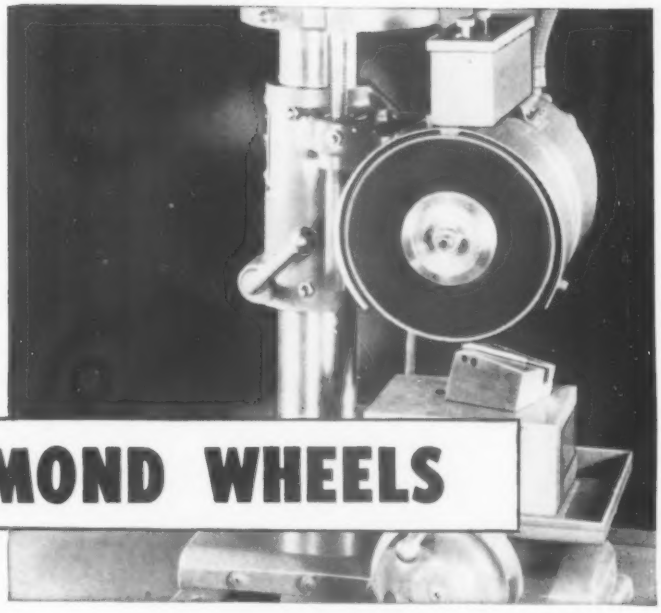


OK

modern milling cutters for modern milling machines

THE OK TOOL COMPANY, Milford, New Hampshire

FOR THE HARDEST GRINDING



MANHATTAN DIAMOND WHEELS

DO NOT LOAD OR GLAZE

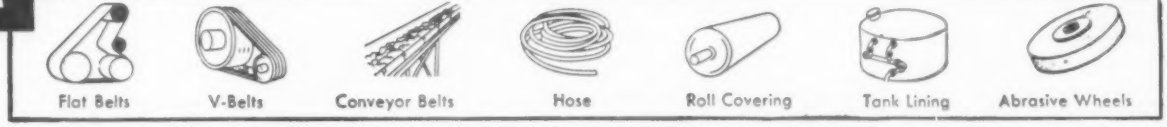
"Best we've tried" say users who settle on Manhattan Diamond Wheels for grinding of carbides, or quartz and synthetic sapphire.

It's Manhattan's bonding that makes these wheels better. You can grind soft or hardened steel shanks in conjunction with grinding carbide inserts without loading or glazing the wheel. Manhattan Diamond Wheels need no dressing. They are unexcelled for economy and precision on surface, cylindrical or internal operations. Try them . . . write to

DIAMOND WHEEL DEPARTMENT

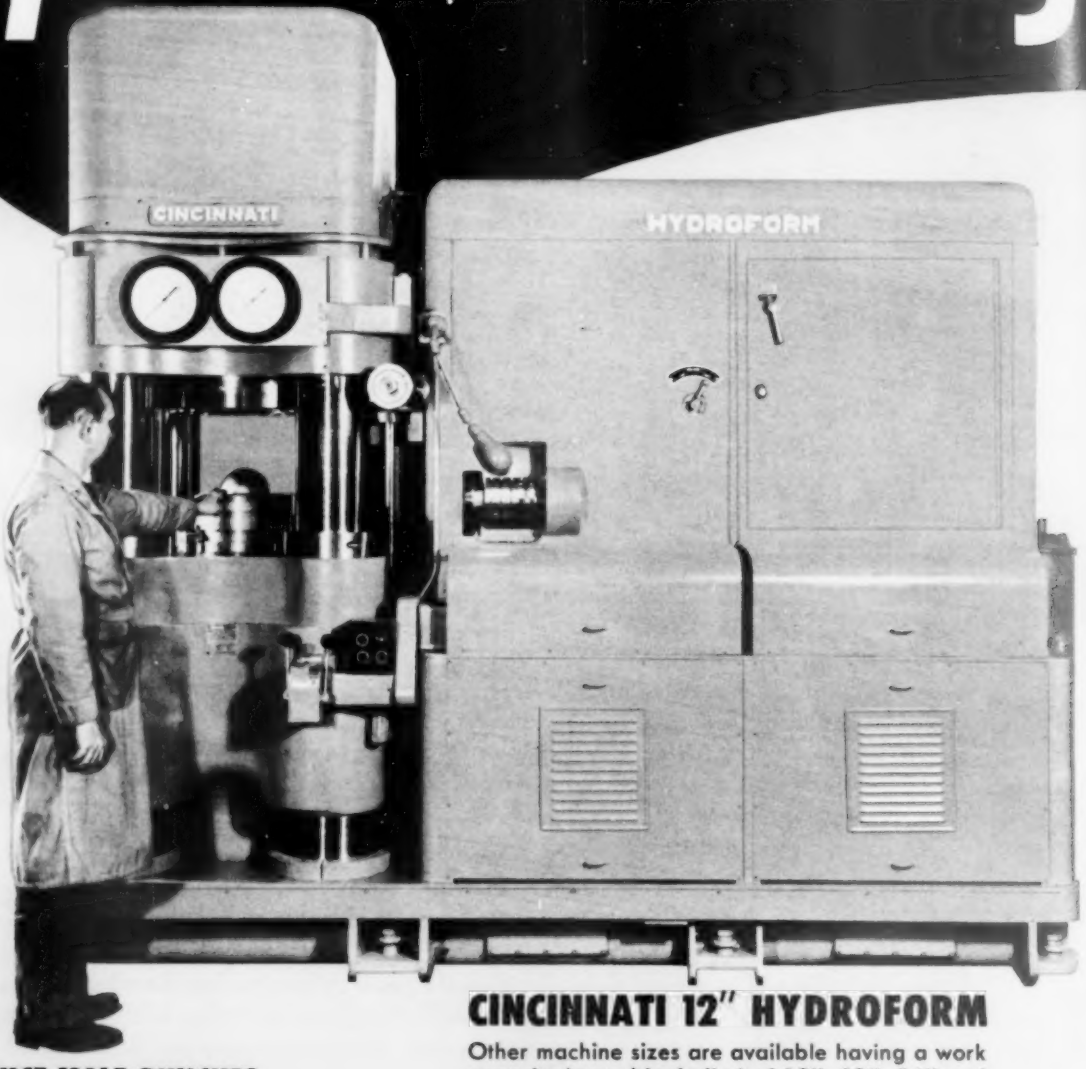
MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls

Hydroforming

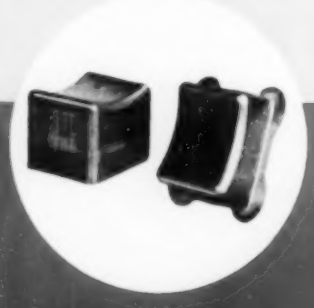


CINCINNATI 12" HYDROFORM

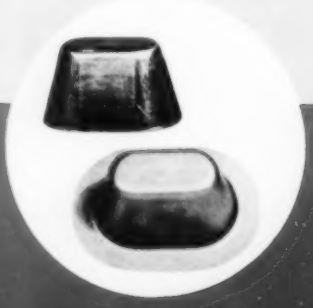
Other machine sizes are available having a work capacity (max. blank dia.) of 19", 23", 26" and 32". Information on machines of larger capacity furnished on request.

EASY-TO-PRODUCE MALE PUNCHES MATERIALLY REDUCE TOOL COSTS

Shown below are typical examples of the simplicity of Hydroform tooling.



Punch of 1020 Steel
Part of .037" Mild Steel



Punch of 1020 Steel
Part of .045" Stainless

Punch of 1020 Steel
Part of .032" Aluminum

Punch of Kirksite
Part of .037" Aluminum

cuts the cost of tooling for deep draw work

TOOL COSTS CAN RUN AS LOW AS 10% OF CONVENTIONAL DIE SET COSTS!

Hydroforming is deep drawing by use of a male punch working upward into a *flexible die member* . . . a built-in feature of the Cincinnati Hydroform that replaces *more than half* the parts of the conventional draw die.

Hydroform tooling consists simply of a punch of the desired shape, and a draw ring contoured to fit around the punch. Normal clearance between the punch and draw ring is 50% or more of the thickness of the material being formed—eliminating a costly die-maker's fit.

Punches can be made of untreated steel, cast iron, hard woods, Kirksite, brass, aluminum, or other easily worked materials, depending on the quantity and shape of the part. Punch maintenance is minimized as the cushioned action of the flexible die member reduces punch wear.

The tools are self-centering and easy to locate in the machine. Set-up and changeover of tooling is accomplished rapidly.

Low cost tooling is a major Hydroforming advantage. However, Hydroforming brings to deep drawing *many* other benefits:

- Most parts can be produced in a single draw—eliminating multiple operation processing.
- Practically any shape can be formed from a wide variety of materials up to steel ⅜" thick.
- Part quality is materially improved. Surface finish is unimpaired.

Investigate Hydroforming now. It will change your thinking on deep drawing and forming! Call in your nearest Cincinnati Milling Machine Co. field engineer for a factual discussion of how Hydroforming can cut the cost of your metal forming work. For detailed information on Hydroform machines and the Hydroforming principle, write for Bulletin M-1759.

CINCINNATI

PART DRAW RING PUNCH

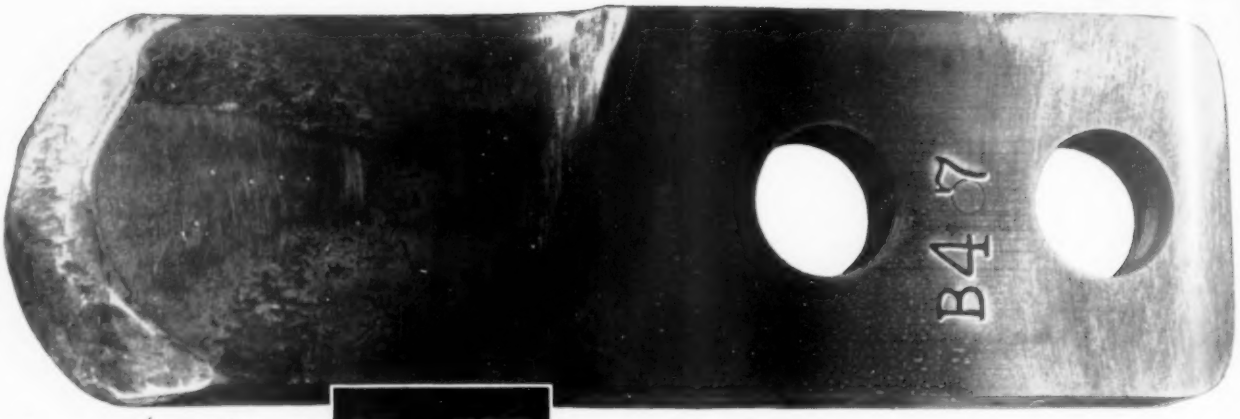
Shown above are the basic elements of Hydroform tooling—a draw ring and punch.

A close-up view of tooling installed in the Hydroform is shown below. Only 7½ hours were required to produce the draw ring and punch from mild steel. The part shown is a high pressure vessel cap of ¼" mild steel, Hydroformed in one operation.

Hydroform

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO



This punch gave double service!

B-47 HOT WORK STEEL

gives you more runs for your money

. . . anywhere from **1½** *to* **5** *times the Performance!*

This block had double life!

This die lasted 50% longer!

SOME TYPICAL EXAMPLES

B-47 dummy blocks, vs. 9% and 12% tungsten types, extruded more than twice as many brass and copper tubes. B-47 dies outperformed 12% tungsten type 1½ to 1.

B-47 punches, vs. low-carbon 18-4-1 type, hot pierced more than twice as many eyes in steel axes. See top picture.

B-47 die inserts, vs. 9% tungsten types, hot pressed more than twice as many steel side gear forgings. B-47 die inserts, vs. regular insert material, performed better than 5 to 1.

B-47 dummy blocks, vs. 5% tungsten-5% chromium types, extruded twice as many copper and brass tubes and rods. B-47 dies outperformed 12% tungsten-12% chromium type.

B-47 punches, vs. 5% chromium type, hot extrusion forged 1½ times as many automotive steel front axle spindles.

B-47 die inserts, vs. 9% tungsten types, extruded 1½ times as many high alloy steel automotive valves. This is considered a very difficult job for any grade of hot work steel.

SEND NOW

for "Blue Sheet" on Grade B-47

This four-page folder gives technical data on B-47 for brass extrusion dummy block and dies, valve extrusion die inserts, hot punch tools, forging die inserts, press forging dies, and hot work in general. *Write for your copy today.*

ADDRESS DEPT. TE-35

Looking for a better hot work steel? You'll find it in B-47—an improved chromium, tungsten, cobalt, vanadium type whose superiority is established by actual performance runs such as those summarized above. All tests show that B-47 has unusual resistance to shock and abrasion at elevated temperatures.

Developed originally for applications in the copper and brass industry, B-47 has given excellent results on difficult hot work jobs on steel. B-47, when properly heat treated, exhibits a well rounded combination of red hardness, toughness, and resistance to wear and heat checking that makes it a valuable addition to the Allegheny Ludlum group of hot die steels.

Put B-47 to the test. You'll find that it will do any number of severe hot work jobs without washing out or changing size. Get in touch with A-L, today. Let us help you to use B-47.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

AL FINE TOOL STEELS SINCE 1854

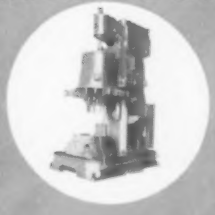
WAD 3530

Your "Hole" Future

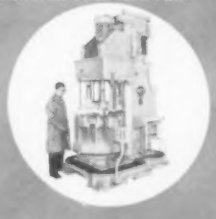
IS ASSURED WITH NATCO EQUIPMENT

ENGINEERED FOR QUALITY AND QUANTITY PRODUCTION

ADJUSTABLE SPINDLE MULTI-DRILLER AND TAPPER



MEDIUM SIZED VERTICAL DRILLER AND TAPPER



HIGH-SPEED MULTI-DRILLER OR TAPPERS

A-33 LIGHT SENSITIVE MULTI-DRILLER OR TAPPERS

2-WAY BOREFACE FOR BORING, TURNING AND FACING

3-WAY HOLETAPPER WITH INDIVIDUAL LEAD SCREWS

HOLESTEEL 2-WAY FLOOR TYPE FOR DRILLING AND TAPPING

HOLEWAY AUTOMATIC PROCESSING MACHINES

2-WAY HOLEUNIT FOR DRILLING, BORING, REAMING AND TAPPING

STATION TYPE MACHINES

Here are a few representative machines from the complete NATCO line . . . including a wide range from small, fast, light sensitive multi-drillers and tappers to large automatic processing machines . . . from single spindle to an unlimited number of spindles . . . from 1/16 inch drill to 14 inch or larger bore. Materials worked include iron, steel, bronze, aluminum, plastic and wood. Call a NATCO Field Engineer.

Call a Natco Field Engineer

To help you solve your problems in Drilling, Tapping, Boring & Facing.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices

1809 Engineering Bldg., CHICAGO • 409 New Center Bldg., DETROIT
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Red Shield says:

"You're entitled to the best–

Use STANDARD REAMER."

Standardize and Save With Standard Red Shield Metal Cutting Tools. There is a Standard Distributor Near You and Ready to Serve You.

STANDARD TOOL CO.

3950 CHESTER AVENUE
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New York • Detroit • Chicago • Dallas • San Francisco

THE STANDARD LINE: *Twist Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools*

Designed for those who need LIGHT-HEAVYWEIGHT Machines

New 16″ and 14″ Band Saws by WALKER-TURNER

For jobs where neither the capacity nor expense of a heavy industrial machine is warranted, and where a "hobby machine" would be wholly inadequate, Walker-Turner has engineered a special class of *light-heavyweight* Band Saws.

Professional in design and operation, yet light for production machines, the Walker-Turner Light-heavyweights give industry the capacity needed for short-run production work, without the necessity of heavy investment. Available in 16″ and 14″ models for both metal-cutting and wood-working. For complete information, write name and address in margin below.

16″ WALKER-TURNER BAND SAW

is low in initial cost, high in operating efficiency. Automatic power feed maintains a pre-set feeding pressure, lessens operator fatigue. Capacity: blade to frame 16″, guide to table 8″. One-piece construction for extra strength and rigidity. 8 blade speeds. Fast, safe, and easy to handle.

SOLD ONLY THROUGH TRAINED INDUSTRIAL DISTRIBUTORS

WALKER-TURNER
• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS
BELT and DISC SURFACERS • METAL-CUTTING BAND SAWS
LATHES • SPINDLE SHAPERS • JOINTERS

Use this space

to write for full details and specifications.
Walker-Turner Division, Kearney & Trecker Corp.
Dept. T-11, Plainfield, N. J.
(Please write your name and address in margin of page)

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

In the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

How Reducing Tool Hardness Tripled Output

A container manufacturer had been using several different grades of tool steel for rolls used to seam 18-gage sheet steel. The rolls didn't hold up very well. Asked to study the problem, we recommended our A-H5, a 5-pct-chromium, air-hardening grade.

But in treating the rolls the customer proceeded on the principle that a very high hardness would give longest wear—and hardened them accordingly. As a result they failed prematurely, due to breakage caused by inadequate shock-resistance.

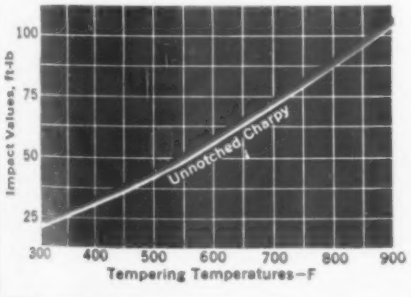
So we made the following recommendations for heat-treatment, asking that they be followed exactly: quench in oil at 1750 F, cool down to 1000 F, air-cool to 150 F, then temper for four hours at 1000 F and again at 950 F. This treatment produced a surface hardness of about Rockwell C-57.

"Not hard enough!" said the customer.

"Give it a trial," we urged.

The first roll so treated lasted nearly twice as long as any previous roll, making 58,000 seams on one groove with very little evidence of wear. A second roll made nearly 100,000 seams!

A tool that's close to its maximum hardness is likely to be brittle. And tools wear too rapidly if hardness is low. That's why most production tools and dies are treated so as to get an ideal compromise between hardness and toughness.



HARDNESS VS. TOUGHNESS — This curve shows how the impact-resistance of a carbon tool steel increases as the hardness is reduced by higher tempering temperatures.

Our modern mill depot is geared for fast shipments of tool steel to distributors everywhere. A wide selection of sizes is stocked in 22 grades of steel.

TOOL STEEL...WHEN YOU WANT IT!

Distributors of Bethlehem tool steel are ready to fill your tool-steel orders from their local stocks . . . in strategic cities throughout the country. Our own mill depot at Bethlehem, Pa., is completely stocked with several thousand sizes of 22 different tool-steel grades for quick shipment to our distributors and to mill customers. Whether you need one short bar or a carload, you can count on fast delivery when you specify Bethlehem.

Our complete line includes: carbon and carbon-vanadium, oil- and air-hardening, shock-resisting, hot-work, high-speed steels . . . and steels for die-casting dies, plastic molds, brake dies and other special applications.

And remember — Bethlehem metallurgists are on call whenever you have tool-steel problems.

HEAVY-DUTY PUNCH

Made of our 67 Chisel, this punch forms parts from .185-in. sheet steel in a 300-ton hydraulic press. The punch must take a lot of shock; and that's why this chrome-tungsten tool steel stands up so well. It's hardened to Rockwell C-58.

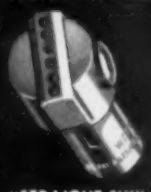
The lower die, hardness Rockwell C-61, is made of Lehigh H—our popular grade of high-carbon, high-chromium steel. About 5000 pieces are produced on this heavy-duty job before redressing is required.

RADIUS FORMING TOOLS

"TRU-LINE" PROFILE DRESSING TOOLS

IMPREGNATED DRESSING TOOLS

STANDARD DRESSING TOOLS



"STRAIGHT-SIX" DRESSING TOOLS

"TRU-THREAD" THREAD DRESSING TOOLS

MULTI-DIAMOND TOOLS

NEW DIAMOND GRIT TOOL

makes big cut in thread grinding costs.

After two years of laboratory work and extensive production line testing we are happy to announce another important Wheel Trueing original—our new Diamond Grit Tool for dressing V and straight line form thread grinding wheels.

This new tool is a saturated concentrate of pure, sharp diamond grits in a special alloy matrix which wears so that there are always sharp grits exposed, giving effective cutting until the tool is used up.

Lighter dresses are effective, wheel life is increased and more pieces are produced per dressing. Remarkable savings have been demonstrated, one world known corporation reporting a projected annual saving in five figures.

Diamond grits are selected for each specific type of thread grinding operation. Write us in detail as to your needs and we will be glad to make a recommendation.

Please address your inquiry to our nearest company office.

WHEEL TRUEING TOOL COMPANY

3200 West Davison Avenue • Detroit 6, Michigan

WHEEL TRUEING TOOL COMPANY OF NEW JERSEY

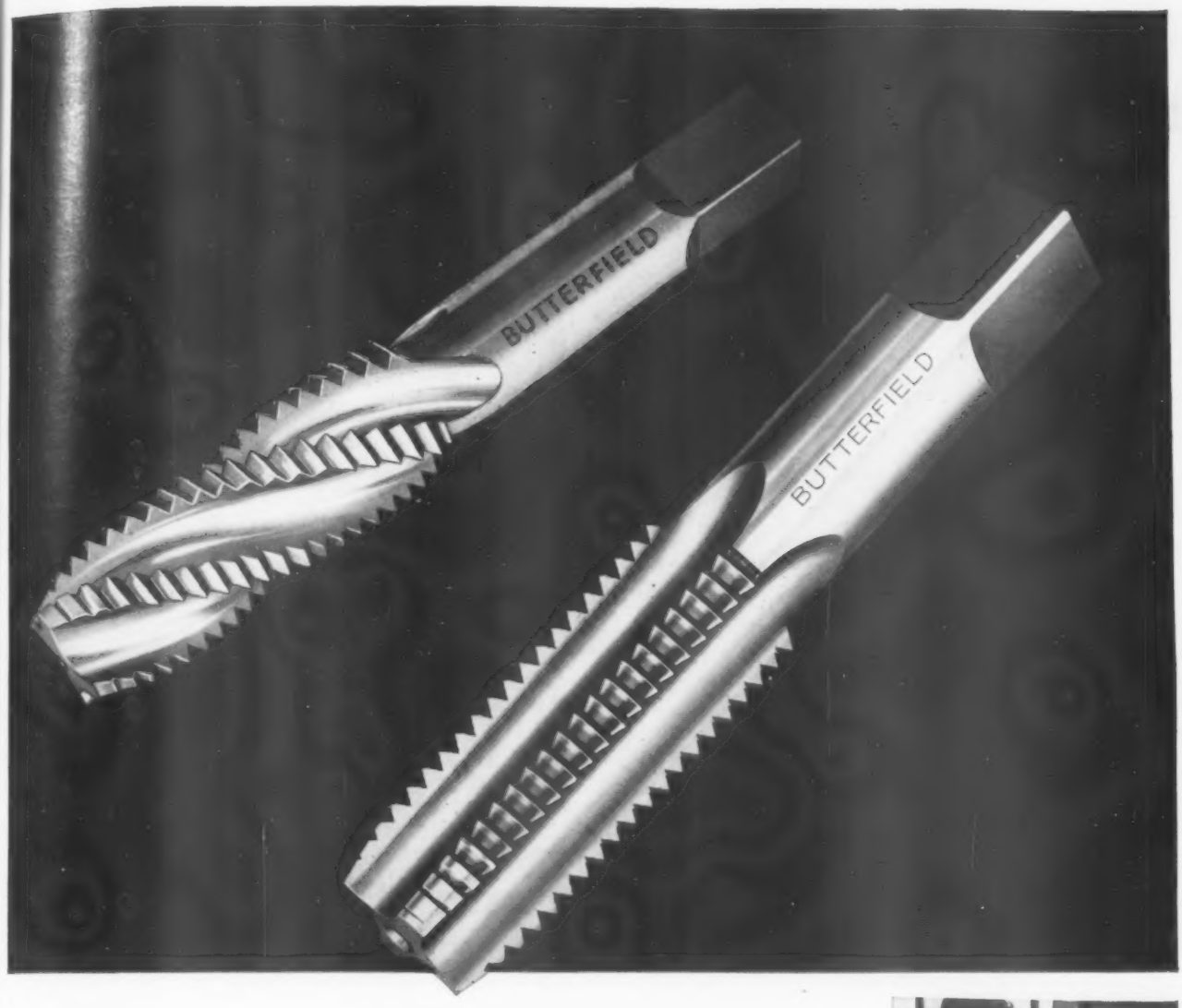
33 West Street, Bloomfield, N. J.

ESTABLISHED 1910

WHEEL TRUEING TOOL COMPANY OF CANADA, LTD.

575 Langlois Ave., Windsor, Ont.

OFFICES IN PRINCIPAL CITIES



THEY BRING ASSURED ACCURACY TO YOUR TAPPING JOBS

With Butterfield Taps you eliminate all risk of getting a defective tap that has been overlooked in ordinary factory spot-checking.

Each Butterfield Tap is individually inspected to make sure it will do a fast, clean, trouble-free job of threading.

That's why continued use of these 100% inspected tools is a long range policy that pays off in smoother, more economical production.

In the complete Butterfield line there's a tap for best results in every tapping application, in every material. Union Twist Drill Company, BUTTERFIELD DIVISION, Derby Line, Vermont. *In Canada:* Rock Island, Quebec.

INSPECTOR checks thread form and lead on a Hartness Comparator that magnifies 62½ diameters. Part of Butterfield's 100% inspection.

Hand Taps • Machine Screw Taps • Pipe Taps
Stove Bolt Taps • Pulley Taps
Staybolt Taps • Boiler Taps • Nut Taps
Serial Taps • Mud or Washout Taps

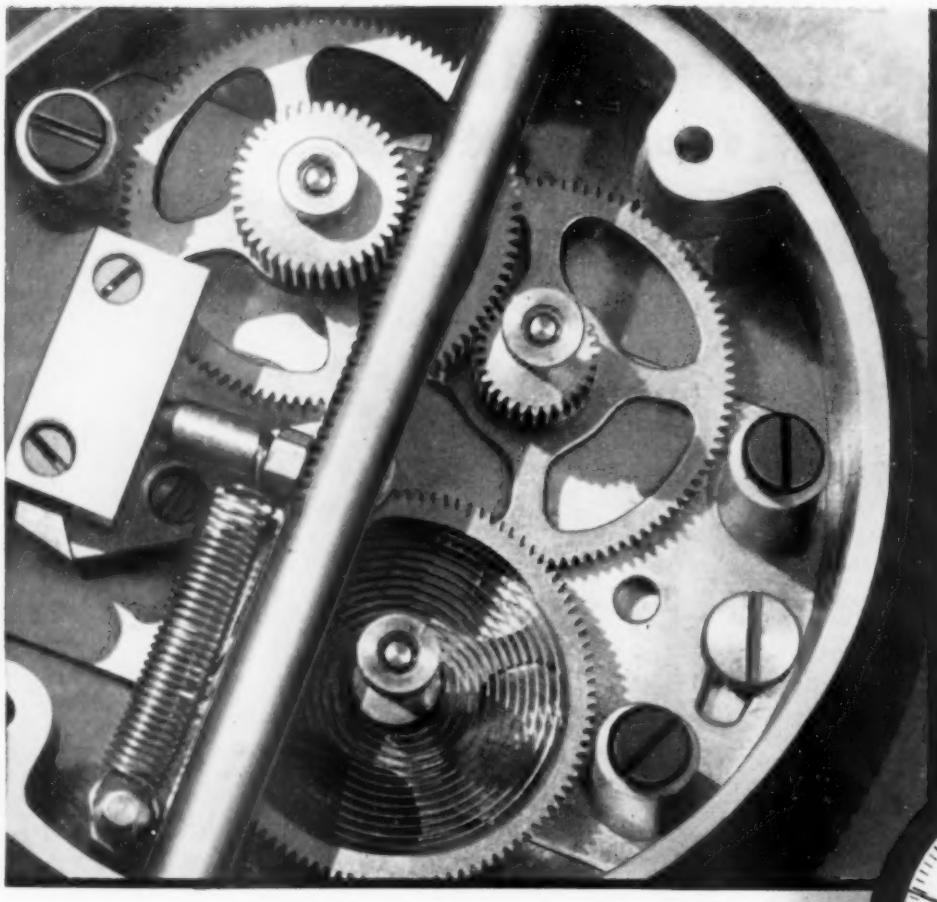
SEE YOUR NEARBY BUTTERFIELD DISTRIBUTOR FOR PROMPT DELIVERIES AND SERVICE

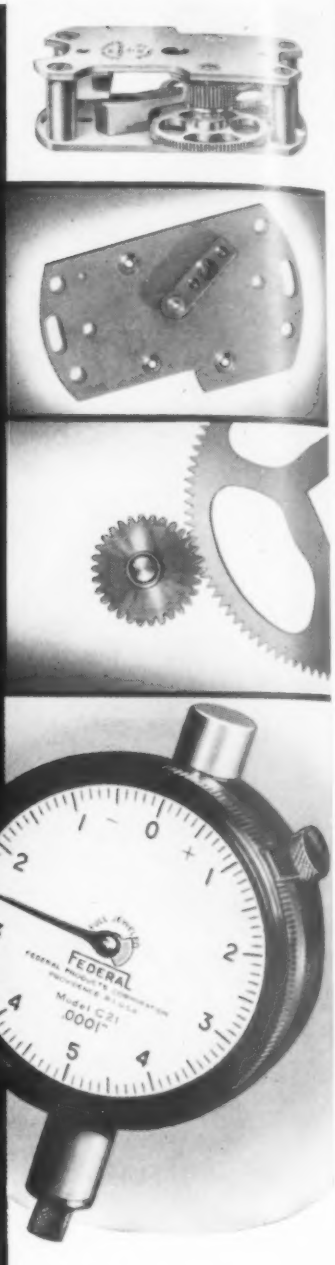
BUTTERFIELD

THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES





The Dial Indicator Built as Fine as the Finest Watch

Today the Dial Indicator is built mechanically as fine as the finest watch, for years the standard of comparison for fine manufactured articles.

The distance the contact point of a Dial Indicator moves must be accurately magnified by its rack and gears so that the amount of this distance will be accurately indicated by the dial graduations.

Gear teeth must be so designed and precisely cut they will magnify the movement of the contact point accurately and positively. All bearings and bushings must fit precisely so there is no lost motion and yet they cannot fit so tightly as to cause excessive friction. Inertia must be held to a minimum. All these details are necessary if a Dial Indicator is to be sensitive to slight dimensional variations.

A Dial Indicator must have exceptional fidelity in order to always "repeat" the same reading for the same amount of variation.

And, finally, a Dial Indicator must have the stamina and durability to withstand sudden shock and rough abuse.

At Federal Products Corporation we are constantly aware of the importance of these requirements. Federal leads in the development of Low-Friction, Low-Inertia, Full-Jeweled Indicators. Federal's top and bottom movement plate construction has long defied improvement and Indicator maintenance men prefer it to all others.

Send for Federal's latest catalog showing the most complete line of Dial Indicators and Indicating Gages. FEDERAL PRODUCTS CORPORATION, 1911 Eddy Street, Providence 1, Rhode Island.

ABOVE ILLUSTRATIONS
(Top to Bottom)

Note rigid assembly of top and bottom plates and massive support for pinion bearing — features which mean long lived accuracy.

•

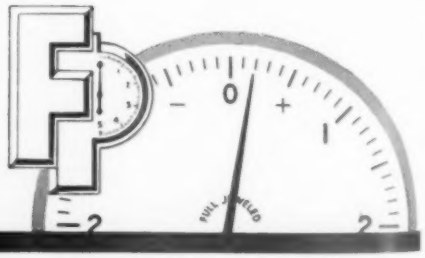
Bottom plate of heavy gage brass showing jeweled bearings and precision workmanship.

•

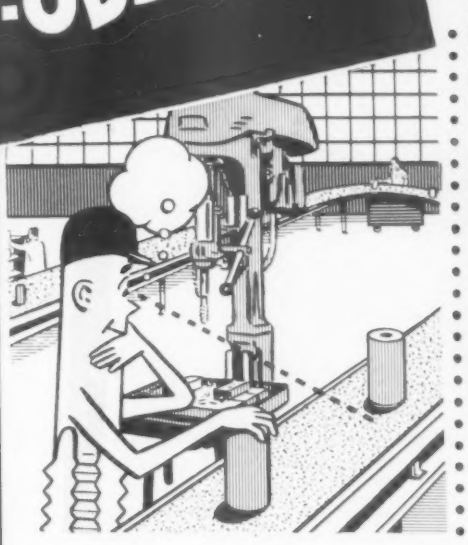
Teeth of gears and pinions are cleanly cut — not stamped — and they mesh accurately.

FEDERAL

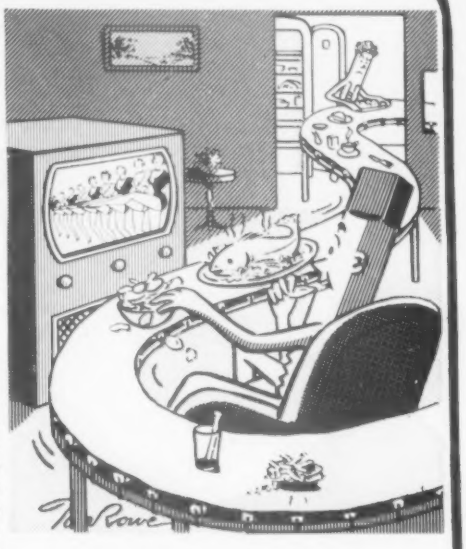
Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES



TAP-ODDITIES



Pete—on the production line
Is free from all "chip trouble".
Thinks Pete—this same hi-speed technique
Will make home pleasures double.



A conveyor from the kitchen
Now serves "snacks" constantly.
And Pete has no "chip trouble"
On the "swing shift" of TV.

Manufacturers cannot afford to have production lines held up by "chip trouble" on a tapping operation, where one weak link in the chain, throws the entire setup out of gear.

That's why the dependable uniformity of BATH "ground from the solid" TAPS is an important feature wherever a rigid quality control system is maintained.

Bath Taps are designed to have ample chip room . . . the smooth flute surface permits chips to slide instead of piling up. Every Bath Tap is the same . . . no clogging . . . no binding to cause torn threads . . . no costly hold up of the production line.

For long wear and efficient work, insist on Bath ground thread Taps in stock or special sizes.

INSIST ON BATH TAPS
—PROFIT BY THEIR
PLUS—PERFORMANCE

JOHN BATH CO. INC. · WORCESTER · MASS ·

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

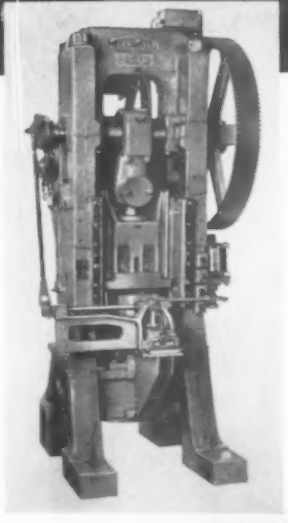
JOHN BATH CO. INCORPORATED

28 Grafton St., Worcester, Mass.

U. S. Slide Feeds Solve Your Press Room Problems

For Example . . .

The Cleveland Punch and Shear Works Co., Cleveland, Ohio, received an order from The Metal Specialty Company of Cincinnati to furnish a number of their presses equipped with automatic feeds to feed $1\frac{3}{8}$" diameter bar stock into the press for a cut-off operation. Because of the nature of the job and the accuracy required, U. S. Slide Feeds were selected.



Accuracy . . .

With the set-up illustrated, the accuracy of feed length must be such that the weight of the cut-off pieces be within closely controlled limits. The U. S. Slide Feed advances the $1\frac{3}{8}$" diameter bar stock into the die $\frac{3}{4}$" at each stroke of the press, and the weight of the cut-off pieces varies less than one gram! With the U. S. Slide Feed the travel of the feed block is constrained between positive stops, thus assuring controlled accuracy.

Versatility . . .

U. S. Slide Feeds are known for their accuracy in feeding flat stock from coils, but as described above, they can be used with equally satisfactory results for feeding round wire, bars, and stock of irregular cross-section. And in addition to metals, U. S. Slide Feeds can be used for feeding materials such as paper, plastic, mica, etc.

If you have a press feed problem, ask for a copy of Bulletin 80-E on U. S. Automatic Press Room Equipment. It contains illustrations and descriptions of U. S. Slide Feeds, Straighteners, Stock Reels, Coil Cradles, Stock Oilers, Scrap Choppers, etc.

US PRODUCTS

U. S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers

U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

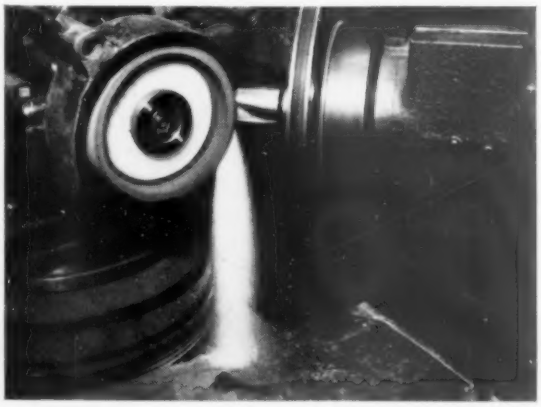
In the shop of an electrical manufacturer, a Robertson WA301-H3V Segmental Wheel operated for 4 hours without a squeal. It ground boiler plate, Neor, Hampden, cold rolled and Hi-Carbon Hi-Chrome steel. Wheel wear at the end of the run was only 1/8". And the Robertson wheel was 1/2" narrower and required less dressing than the conventional wheel formerly used.

IN THE TOOLROOM OR IN THE SHOP ROBERTSON COOL-CUT GRINDING WHEELS GIVE YOU ADDITIONAL PRODUCTION TIME

Manufacturers throughout the country realize the value of using Robertson Cool-Cut Grinding Wheels to save production time, increase output, and lower wheel costs.

They find that these *open structure* wheels assure maximum chip clearance, cut cooler, cut faster, require fewer dressings, and last longer than conventional wheels.

For practically any grinding operation—surface, internal, tool and miscellaneous—there's a Robertson Cool-Cut to meet your particular requirements. Write for your free copy of "How to Buy Production Time."



Another manufacturer found that Robertson Cool-Cut Wheels were cooler cutting even on the hardest metals and that finishes were well above production standards. A Robertson RA605-KV Wheel will successfully grind plug gages, punches, reamers and numerous other tools.

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

Miller

HIGH PRESSUR

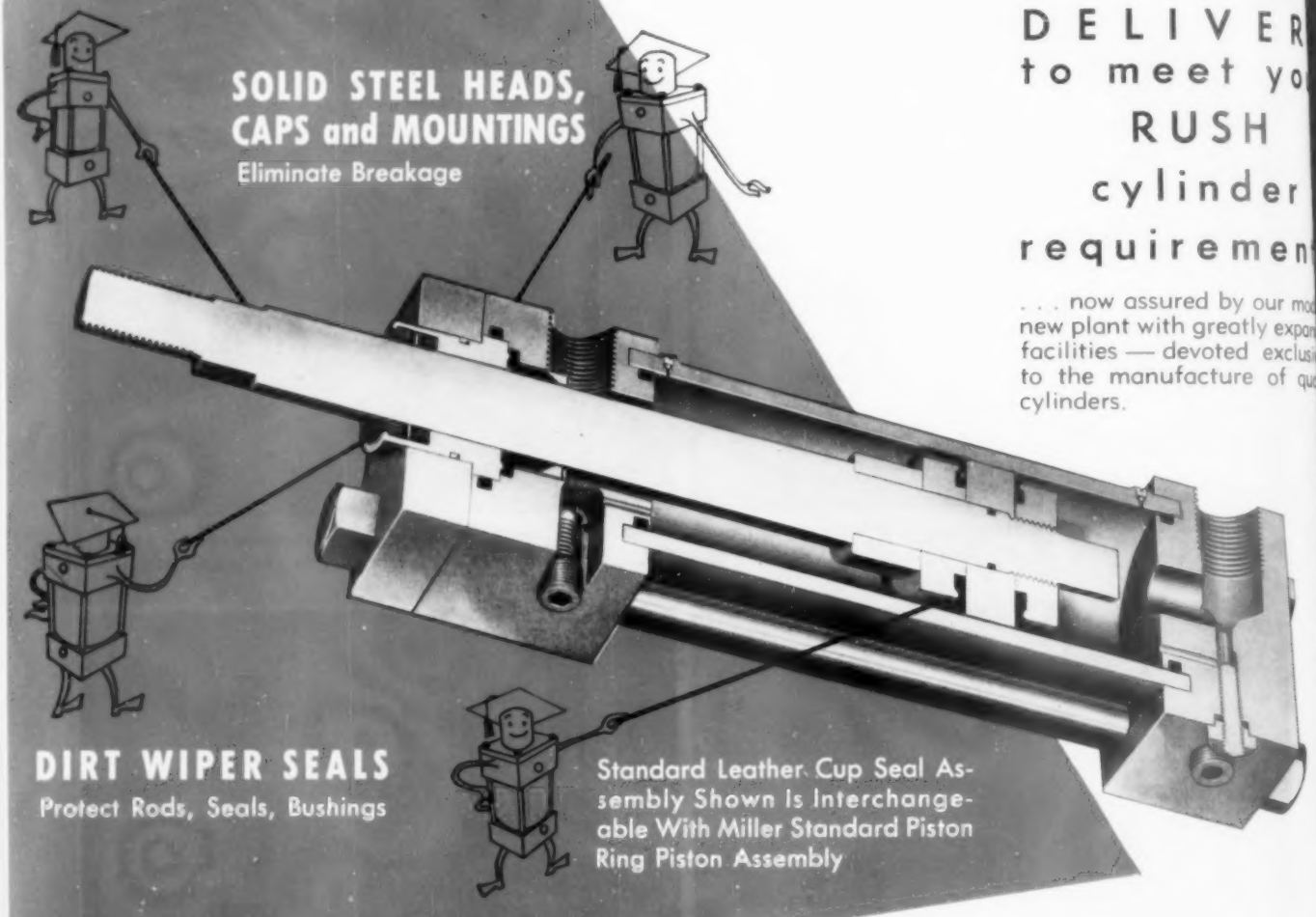
HYDRAULIC CYLINDER

HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

FOUR WEE
DELIVER
to meet yo
RUSH
cylinder
requiremen

. . . now assured by our mo
new plant with greatly expan
facilities — devoted exclusi
to the manufacture of qu
cylinders.



DIRT WIPER SEALS
Protect Rods, Seals, Bushings

Standard Leather Cup Seal Assembly Shown Is Interchangeable With Miller Standard Piston Ring Piston Assembly

WRITE FOR CYLINDER BULLETINS H-104 and A-105

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. HYDRAULIC STANDARDS years before their adoption in 1949.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

Miller

MILLER MOTOR CO

2010 N. HAWTHORNE AVE. • MELROSE PARK,

AIR & HYDRAULIC CYLINDERS • BOOSTERS •
COUNTERBALANCE CYLINDERS


NOW HE KNOWS IT'S RIGHT. "He" could be a final or process inspector, a foreman or a tapping machine operator — anyone at a key point on the production line.
But, he could also know when all is **not** well. This gage could warn of a dull tap, a drill going wrong, misalignment in a set up. All these and other faults can be detected by proper gaging.
Know that it's right. Prevent waste. Use good gages!
GREENFIELD TAP and DIE CORPORATION
GREENFIELD, MASSACHUSETTS

self-opening die head

for light duty threading on hand operated machines

Style C

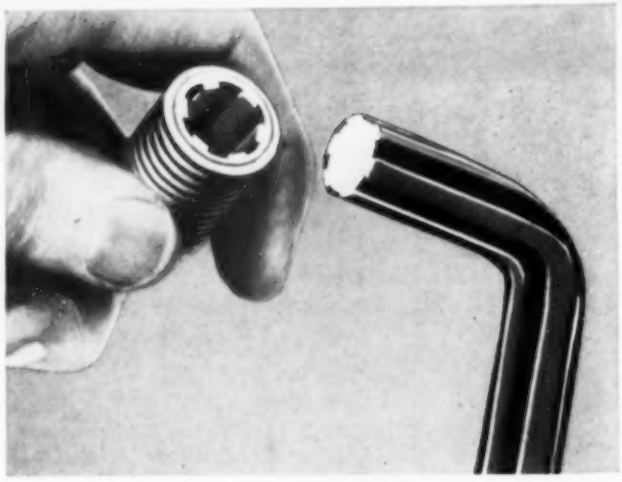
This Head is especially intended for the lighter classes of threading done on hand operated machines. It is designed to cut large and reasonably fine pitch threads. Made without a face plate, the Style C is ready at all times for threading close to shoulders. This versatile head is made in three different types — Pull-Off type for cutting screw threads of moderate length; Inside Trip Type for use on irregular lengths where length of thread must be accurately repeated; Outside Trip Type for fine pitch threads of short length where chasers and threads must be relieved of all stress in tripping. Available in twenty-three styles and sizes with capacities from ⅜" to 6

SPECIFICATIONS STYLE C WITHOUT LATERAL FLOAT … -OFF TRIP

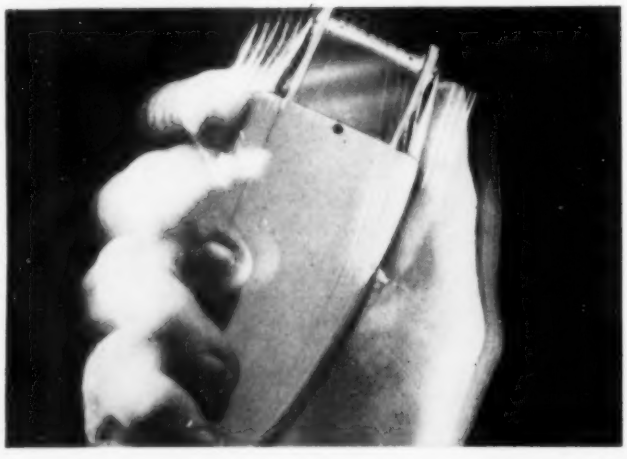
Style and §Size Inches	Construction Number	CAPACITY				Code Word	A	B	C	D			SHANKS					
		Straight Threads			Standard Pipe Threads								Standard		Also Available			
		Diam. Inches	* Lgth.	Coarsest Pitch											‡Max.		△Min.	
													Dia.	Lgth.	Dia.	Lgth.	Dia.	Lgth.
C-1¼	12678-K	⅜" to 1¼"	2"	8	⅛"– ¾"	Cameo	3⅞"	3"	1⅝"	1⅜₁₆"	1⅛"	1⅜"	1¼"	3¾"	1½"	3¾"	1"	1½"
C-1¼	A6393-D	¾" to 1¾"	2"	8	½"–1¼"	Canter	4½"	3⅛"	2⅛"	1¹³⁄₁₆"	1⅛"	1⅞"	1¾"	4"	2⅛"	4"	1⅛"	2"
C-2¼	A5167-J	1¼" to 2¼"	2¼"	8	1" –1½"	Canvas	4¹³⁄₁₆"	3⅜"	2⅛"	2⅝"	1⅛"	1⅜"	2"	4¼"	2⅝"	4¼"	1¼"	2"
C-2½	20504-F	1½" to 2½"	2"	8	1¼"–2"	Carte	5¼"	3⅛"	2¹³⁄₁₆"	2⅜"	1⅛"	1⅜"	2¼"	4½"	2¾"	4½"	1¼"	2"
†C-2½	12744-D	1¼" to 2½"	3⅞"	7	1" –2"	Carmine	5¼"	4¹³⁄₁₆"	2¹³⁄₁₆"	2⅜"	1½"	2⅞"	2¼"	4¾"	3"	4¾"	1½"	2"
C-3	30123-H	1½" to 3"	2½"	8	1¼"–2"	Catch	5⅞"	3½"	3⅜"	3⅛"	1⅛"	1¾"	2¼"	4¾"	3⅜"	4¾"	1½"	2"
†C-3¼	93271-R	2⅛" to 3¾"	2¾"	8	2"	Cement	6½"	3⅞"	4⅛"	3¹³⁄₁₆"	1⅛"	2⅛"	2½"	5"	4⅛"	5"	1¼"	2"
†C-4¼	49270-C	2⅞" to 4¾"	3½"	7	***2½"–4"	Certain	8¼"	5¼"	5⅛"	4¹³⁄₁₆"	1⅜"	2⅝"	2¾"	5½"	5"	5½"	2"	3"
†C-6	28831-E	3⅛" to 6"	3¾"	7	***3" –5"	Chauk	11"	5⅛"	6⅜"	6¼"	1¼"	3"	3"	5¾"	5½"	5¾"	2¼"	3"

§Other sizes can be furnished where required. Price quoted on specific inquiries.
†These Die Heads are fitted with Roughing and Finishing Attachment.
*Length that can be cut when shank is solid.
***Projection Chasers required for pipe sizes within listed capacities.
‡Maximum shank without bushing.
△Minimum recommended size.

GEOMETRIC TOOL COMPANY DIVISION
Greenfield Tap and Die Corporation
NEW HAVEN 15, CONNECTICUT



Your key to TIGHTER assembly



...despite severe VIBRATION!

This Bristol wrench and Multiple-Spline Socket Screw is your key to tighter assembly despite severe vibration.

Here's why: Bristol's *exclusive* multiple-spline socket permits tightening beyond limit possible with any other type of screw . . . turns internal wrenching force into *rotary motion*, not expanding pressure. Hence, no bursting, no rounding out of socket walls—even in sizes down to No. 3, 2, 1, 0 wire.

Other advantages: Permits reduction in flange sizes . . . neater, more compact design . . . easy fastening in out-of-the-way places. A reverse flick of the wrench loosens the set, simplifies take-apart.

If your product must resist severe vibration, specify Bristol's Multiple-Spline Socket Screws.

HEX SOCKET SCREWS, TOO . . .

Only Bristol gives you the right socket screw for every application.

BRISTOL'S SOCKET SCREWS

Multiple Spline and Hex Socket Screws, Cap and Set

THE BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

USE READER SERVICE CARD; INDICATE A-11-196-1

DUAL CROSS and ROTARY FEED

PALMGREN

Rotary, Index, Milling Table

No. 83

Now Only $54.50

Turns Your DRILL PRESS Into A VERTICAL MILLER

Think what this will mean in your shop! Can be used on any Drill Press, Lathe or Milling Machine and provides what is practically a universal milling machine.

Designed for use in all types of metal and woodworking shops. A precision table permitting fine work to close tolerances. It is accurate, speedy, well constructed and attaches quickly in a firm position.

Rotary feed calibrated in degrees; Cross feed in thousandths; Dual Cross Slide with cross feed 2⅜" each side of center or 4¼" overall. Has acme thread cross feed screws, adjustable gibs on cross slides. 40 to 1 worm and gear ratio in rotary feed. Equipped with bolt slots and locking screws.

No. 83 Table Dia. 8", T-Slots ⅜", Base Keyway ⅜", Base Dia. 6¼", Ht. 5", Wt. 37 lbs. Price Only $54.50. Other Types available, No. 82 Dual Cross Feed only $39.75; No. 86 Rotary Feed Only $42.50.

Order Today! If dealer can't supply, write us. Ask for Circular No. 10

CHICAGO TOOL and ENGINEERING CO.

Mfrs. of PALMGREN PRODUCTS Since 1918

8391 South Chicago Ave. • Chicago 17, Ill.

USE READER SERVICE CARD; INDICATE A-11-196-2

ELIMINATE * HUMAN ERRORS WITH INDICATING MICROMETER & COMPARATOR

COMPARATOR MASTER MICROMETER GO-NO GO GAGE 1" RANGE IN 10000ths - NO GAGE BLOCKS NEEDED

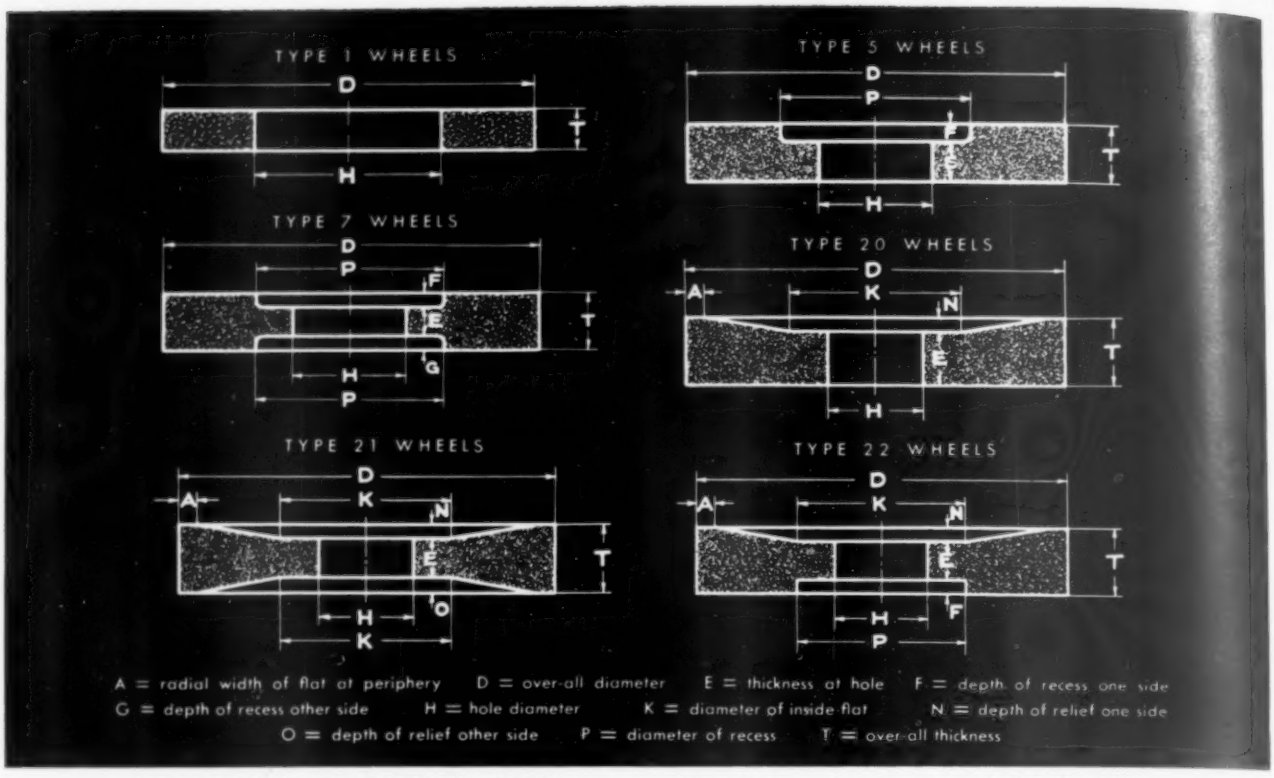
* HUMAN ERRORS THROUGH DIFFERENCES OF "FEEL" ELIMINATED. WILL DETECT OUT-OF-ROUNDNESS, OVALNESS AND TAPER.

SEND FOR ILLUSTRATED CIRCULAR

GEORGE SCHERR CO., Inc.

200C LAFAYETTE ST. • NEW YORK 12, N.Y.

USE READER SERVICE CARD; INDICATE A-11-196-3



WHAT ARE STANDARD GRINDING WHEELS? They are the sizes and shapes selected by the National Bureau of Standards on the basis of: (1) widest use by industry; (2) widest range of adaptability to modern grinding equipment; and (3) most commonly carried in manufacturers' and distributors' stocks.

Specifically, in between-center cylindrical grinding wheels alone, there are 904 different "standards" in the six shapes shown above. For your convenience, they are listed in easy-to-read charts in "Standard Shapes and Sizes of Grinding Wheels" issued with the permission of the National Bureau of Standards.

It pays you 3 ways to use standard grinding wheels

Whatever types of grinding wheels you use, you can depend on "standards" to protect your investment. There are three reasons why:

1. *Standard sizes and shapes are more quickly available to you.* Grinding wheel manufacturers make them faster and in greater quantities . . . are more likely to have them in stock.

2. *Standard sizes and shapes help you keep inventories low.* No need to tie your money up in "specials."

3. *"Standards" give you the benefit of carefully engineered strength* at *all* vital points in *every* standard grinding wheel.

Why use non-standards — when standard sizes and shapes save you time, money, and trouble?

YOU'RE SURE YOU'RE RIGHT when you check your wheels against the simple standard charts in the bulletin "Standard Shapes and Sizes of Grinding Wheels." If you already have a copy, consult it. If you haven't, check the coupon below, and mail it today.

GRINDING WHEEL INSTITUTE, 2130 Keith Bldg., Cleveland 15, Ohio

Please send me:

Standard Shapes and Sizes of Grinding Wheels.

Also the following checked booklets to help me improve my use of grinding wheels:

☐ Safe Speeds for Grinding Wheels ☐ Safe Rules for Disc Grinding ☐ Mounting Techniques for Wheel Sleeves on Cylindrical Grinding Machines ☐ Safe Operation of Portable Grinding Machines ☐ Safe Rules for Handling, Storing and Inspecting Grinding Wheels ☐ Maintenance Recommendations of Heavy Speed, Heavy Duty Swing Frame and Floor Stand Grinding Machines ☐ Standard Specifications of Segments Used in Chucks ☐ Safety Code: The Use, Care and Protection of Abrasive Wheels

Name ..... *Title* .....

Address .....

City ..... *Zone* ..... *State* .....

"—and they chopped down the Old Pine Tree."

Woodsmen Use Marking Devices!

When a forester indicates a tree is to be cut by the lumberjack he usually paints a mark just above the ground and another about breast-high, indicating it is to be cut for lumber purposes. If the tree is diseased he usually marks it with an X or other suitable device, indicating that it is to be cut for destruction or firewood.

CADILLAC MARKING DEVICES

are Designed for ALL MARKING PURPOSES

Whatever your requirements, from small Hand Stamps to Pneumatic, Hydraulic or especially created Marking Machinery, CADILLAC STAMP COMPANY stands ready to supply or design and build to meet your needs.

INTERCHANGEABLE TYPE and TYPE HOLDER SETS

The faces of CADILLAC Steel Letters and Figures combine a high degree of hardness with toughness, insuring especially long life. All CADILLAC Marking Type and the recess in Type Holders are made in standardized dimensions. This means that type will fit interchangeably in hand holders, marking machine holders or punch press holders designed for the size type specified. Due to the precision adhered to in manufacturing, they will when assembled in any holder make impressions in perfect alignment.

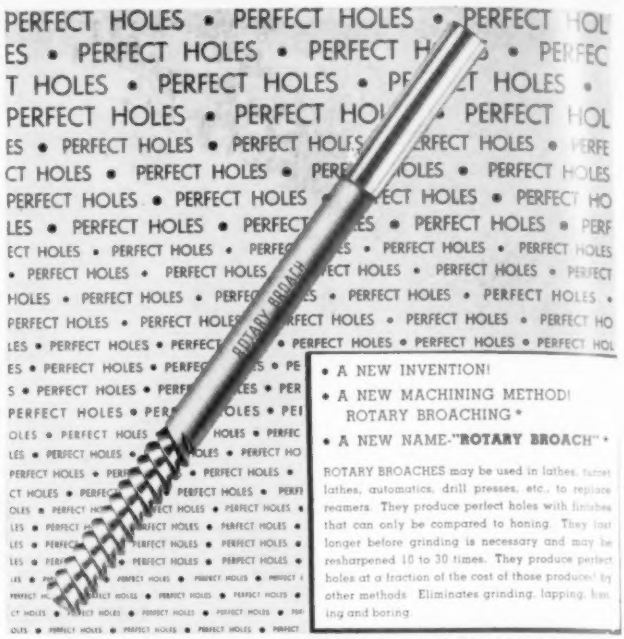
HEAVY BEVEL HAND STAMPS
CADILLAC Heavy Bevel Letters and Figures combine a high degree of hardness with toughness, insuring exceptionally long life.

HAND STAMP SYMBOLS
A system of distinctive symbols for inspection and confidential markings. Write for Symbol Chart.

CADILLAC STAMP CO.
17313 RYAN ROAD • DETROIT 12, MICH.
3000 IRVING PARK • CHICAGO 18, ILLINOIS

USE READER SERVICE CARD; INDICATE A-11-200-1

PERFECT HOLES



- A NEW INVENTION!
- A NEW MACHINING METHOD! ROTARY BROACHING*
- A NEW NAME-**"ROTARY BROACH"***

ROTARY BROACHES may be used in lathes, turret lathes, automatics, drill presses, etc., to replace reamers. They produce perfect holes with finishes that can only be compared to honing. They last longer before grinding is necessary and may be resharpened 10 to 30 times. They produce perfect holes at a fraction of the cost of those produced by other methods. Eliminates grinding, lapping, honing and boring.

USE THIS NEW MACHINING METHOD—ROTARY BROACHING*
You Cannot Afford Not To Use Rotary Broaches (Write for free descriptive literature)

* "Rotary Broach" and "Rotary Broaching" are new names coined and copyrighted by Shearcut Tool Company
Patented in Canada U.S. and Foreign Patents Pending © 1947

When you want Perfect Holes, consult

SHEARCUT TOOL COMPANY
Box 746, Dept. TE 112 • Reseda, California
USE READER SERVICE CARD; INDICATE A-11-200-2

For Better Coolant Flow choose RUTHMAN GUSHER COOLANT PUMPS

Each Gusher Coolant Pump is the result of years of experience in building a *better* pump to give you *better* coolant flow. You get as much or as little as you want the instant you turn on the machine.

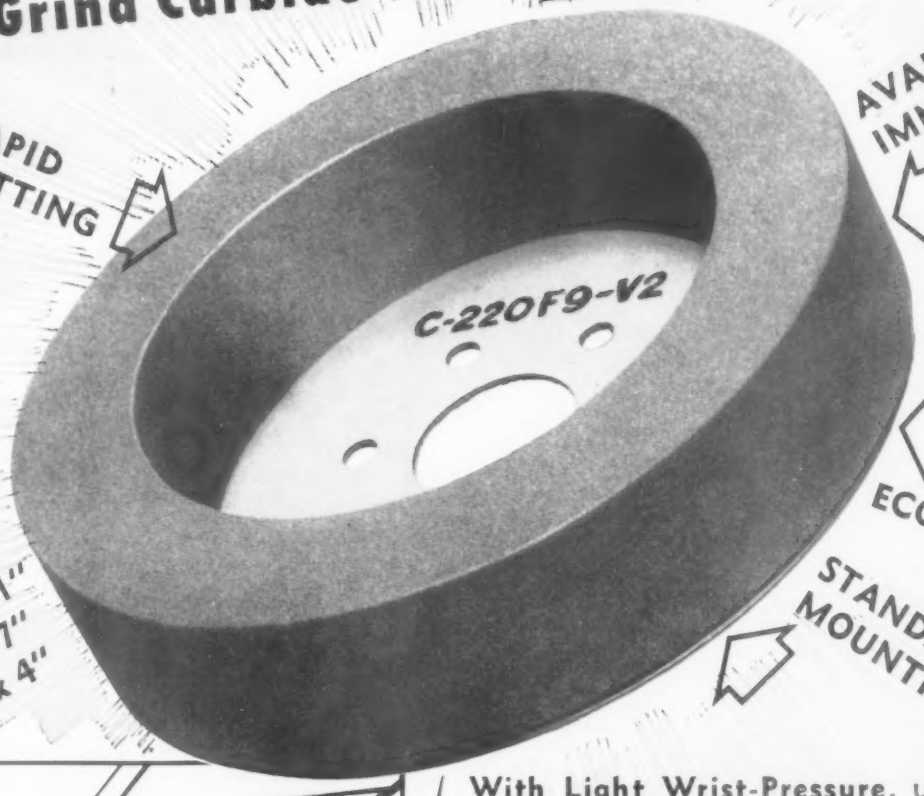
No packing or priming is needed . . . rotating parts are electronically balanced to cut vibration to a minimum . . . pre-lubricated heavy duty ball-bearings need no further attention.

So choose wisely—choose Ruthman Gusher Coolant Pumps.

THE RUTHMAN MACHINERY CO.
1810 READING RD., CINCINNATI, OHIO
USE READER SERVICE CARD; INDICATE A-11-200-3

GOOD NEWS!

NOW-Grind Carbide Tools WITHOUT Diamonds



RAPID CUTTING

AVAILABLE IMMEDIATELY

3 SIZES:
14" x 4" x 11"
10" x 2" x 7"
6" x 1" x 4"

ECONOMICAL

STANDARD PLATE MOUNTING

With Light Wrist-Pressure, under steady coolant flow, these BAY STATE wheels:

1. ***FINISH-GRIND*** **CARBIDE SINGLE POINT TOOLS.**
2. **CUT AS FAST AS DIAMOND WHEELS.**
3. **CUT COSTS TO A MINIMUM.**

IMMEDIATELY AVAILABLE FROM STOCK, these new BAY STATE specifications have been especially developed to help you meet the present and continuing diamond shortage.

TO KEEP PRODUCTION GOING
TO SAVE HARD-TO-GET DIAMOND WHEELS
TO KEEP CARBIDE CUTTING EDGES KEEN

Take advantage of Bay State's Advanced Engineering.

BAY STATE ®

ORDER A TRIAL WHEEL TODAY

BAY STATE ABRASIVE PRODUCTS CO., Westboro, Mass., U.S.A.
Branch Offices and Warehouses: Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

"CONTROLLED-AIR-POWER" SPINS A RIVET NO BIGGER THAN A PIN POINT 60% FASTER, INFINITELY BETTER...

The world over "watch bands by Kreisler" are known for their beautiful styling and superb craftsmanship.

Craftsmanship with Jacques Kreisler Manufacturing Company is not an idle phrase. It's a carefully achieved reality.

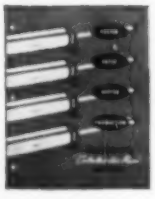
For example, take the tiny snap catch that holds a lady's prized watch secure on her wrist. It is made in two styles, Solid Gold or Gold Filled with stainless steel. The two parts are held together by Solid Gold or stainless steel rivets no bigger than a pin point. The heads are spun riveted and, before "Controlled-Air-Power" came on the job, with tedious care by a foot fed Riveting Machine. The operator, who had to be highly skilled, inserted the pieces in a nest, and closed the holding fixture. Her weight on a foot pedal brought in the riveting heads to spin the rivets from both sides.

From a quality standpoint, inspection had to be rigid. Because the operator had to "feel" her way with the foot pedal, product uniformity was difficult to maintain. Nervous tension and operator fatigue became serious problems.

An electrically controlled Bellows Air Motor, plus tool room ingenuity, proved the answer. Now "controlled-air power" feeds the riveting heads with precision and speed. Production is up 60%, rejects 1% of the old rate, and operator fatigue a thing of the past.

In your plant, too, "Controlled-Air-Power" can make tough jobs easier and even routine jobs more profitable.

No matter what you make, nor how varied your operations, Bellows "Controlled-Air-Power" can contribute to better production efficiency: in greater output, in lower costs, in lessened rejects, in reduced worker fatigue.



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Case history stories, diagrams, photo, production details, etc., showing how Bellows "Controlled-Air-Power" Devices can help you obtain more production at lower cost. No obligation. Write: The Bellows Co., Dept. TE1152, *Akron 9, Ohio. Ask for Bulletin CL-30.*

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AKRON 9, OHIO

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- SEGMENTS
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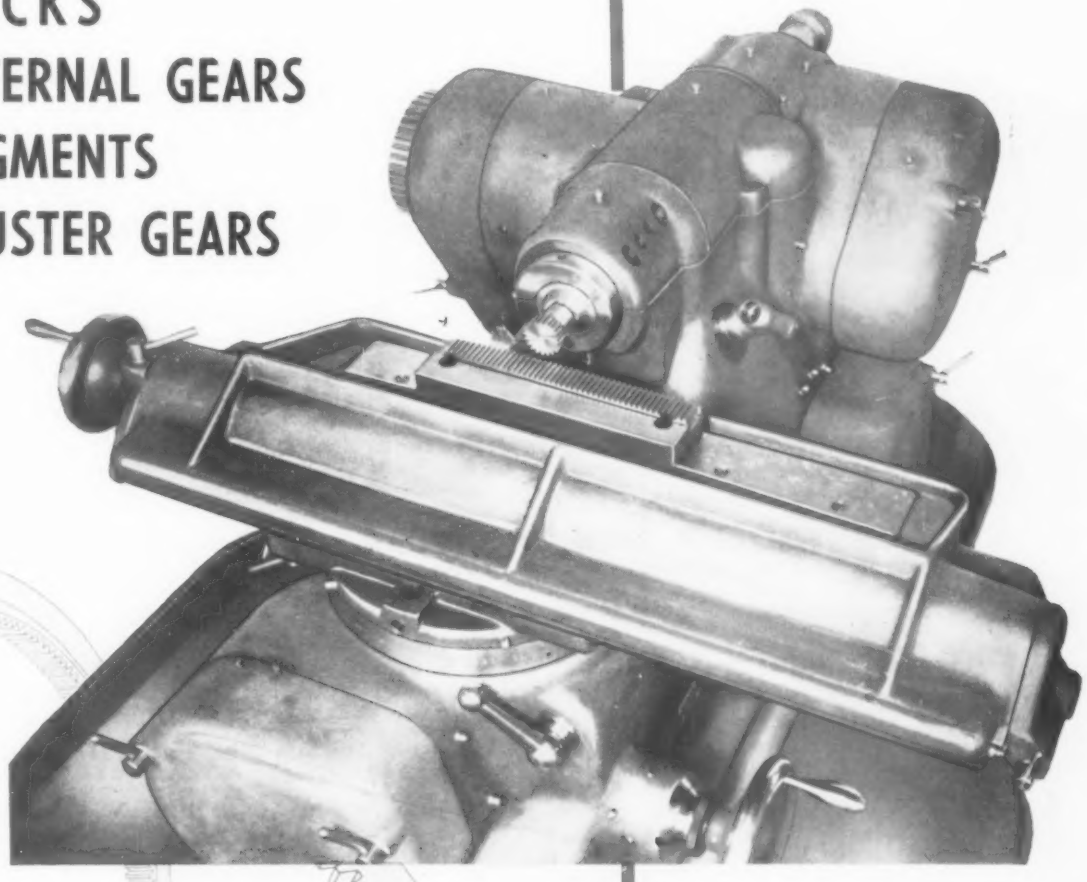

THE precision cutter shapes as it generates tooth forms. The work meets your most exacting specifications and standards. Gear production requiring a shaping operation will be ideally performed with the MIKRON No. 134.

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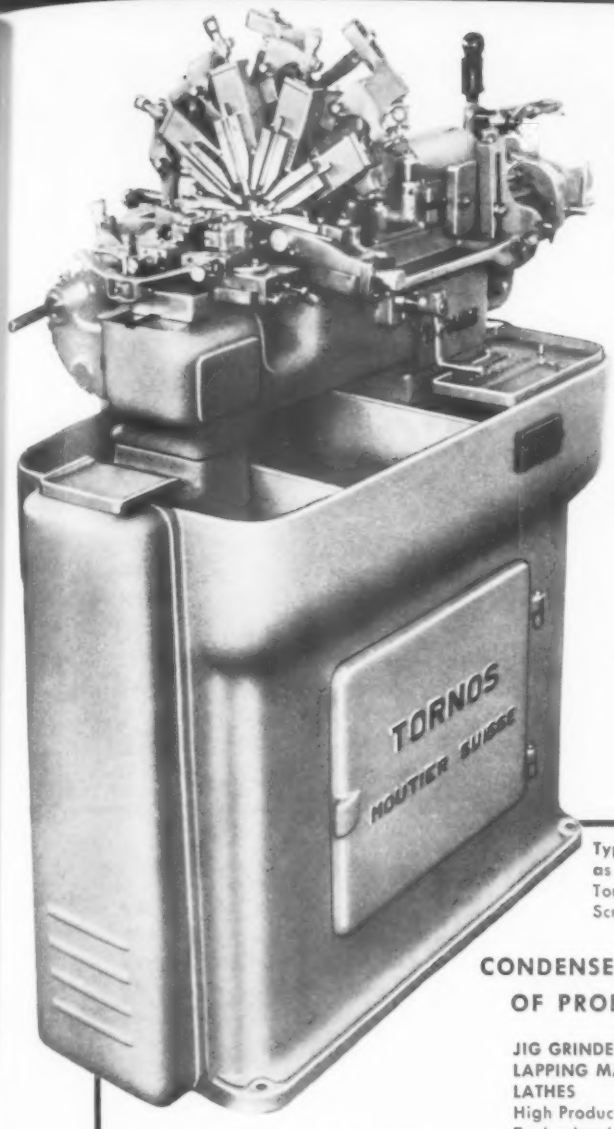

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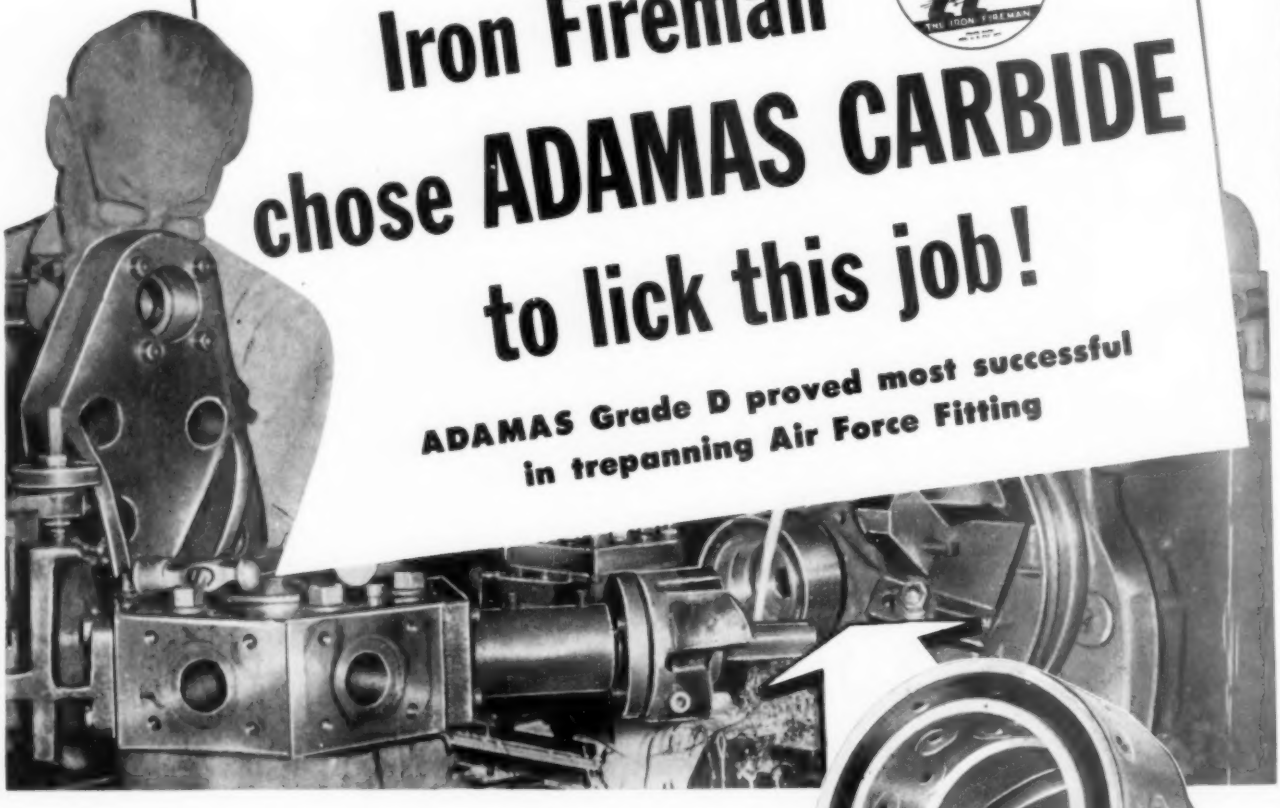
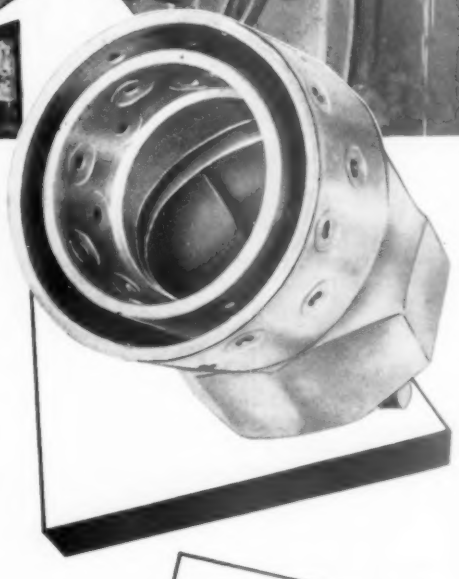
ADAMAS Grade D proved most successful in trepanning Air Force Fitting





PROBLEM: Trepanning a groove 7/16" wide x 2-3/16" deep in a 5" diameter fitting for the U. S. Air Force maintaining 125 micro-inch finish in a semi-finishing operation holding a .005 tolerance on a Warner-Swasey #5 Turret Lathe.

MATERIAL: WD 4140 steel forging heat treated to Rockwell 35-40 C, PSI 140-190,000.

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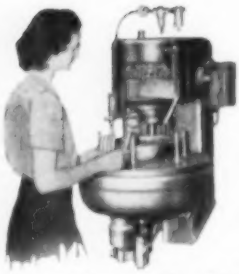
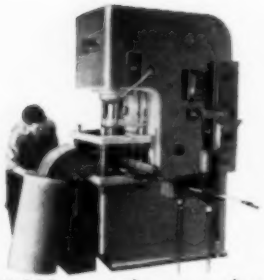
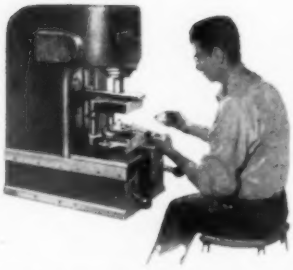


Assembly speed is doubled using Multipress to crimp a small brass contact to pen-type flashlight cases

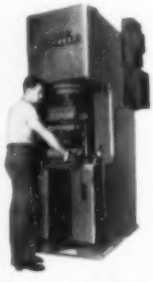


20,000 mop clamps a day is cost-cutting speed of 35-ton Multipress using roll-feed and 4-stage dies



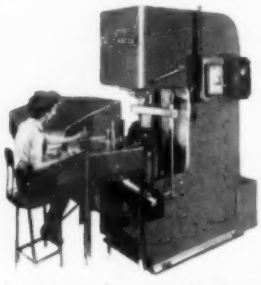
Dies stay sharp twice as long when Multipress is used in trimming flash and gate from die castings

Scrap losses drop sharply as Multipress doubles staking speed on high precision voting-machine counter wheel

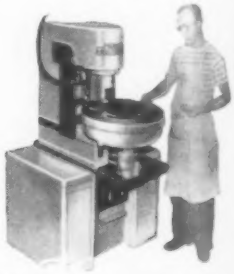


Six hours saved on every 100 finished units as famous electric cleaner plant adopts Multipress to clean cast housings

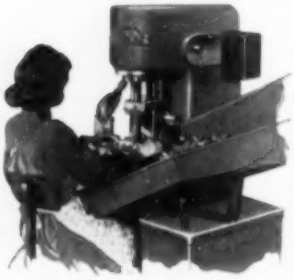
Output is boosted by 100% by famous toy train maker, staking 6-part assembly together with Multipress



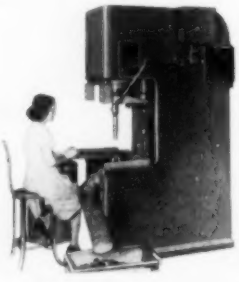
At twice the speed of previous method, Multipress assembles bolts on electrical insulator holders



1600-per-hour rate slashes production costs when 4-ton Multipress is used to broach serrations on small cams



No down-time for repairs in 7 years for Multipress used to bend tabs and arch locks on steel clamps at high speed



Speed doubled on delicate job of drawing thin phosphor-bronze tubes used in forming sensitive thermostat bellows

Less operator fatigue noted as Multipress Midget assembles two check valves to main valves at 450 per-hour

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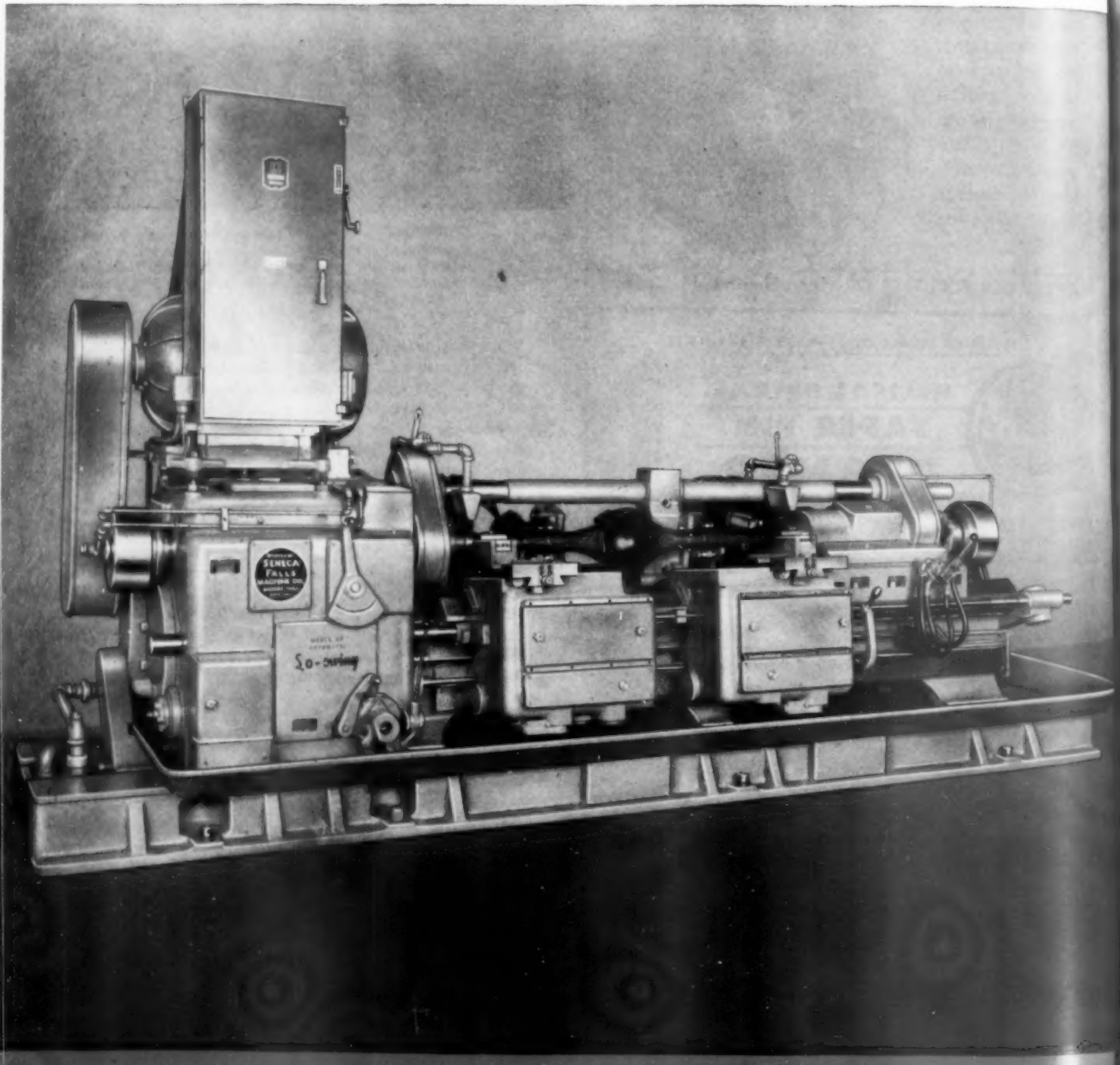
MACHINE OF

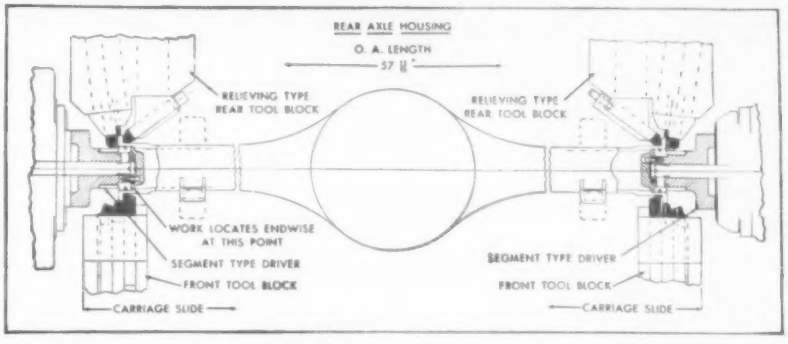
MODEL "AR" *Lo-swing* WITH DOUBLE END DRIVE CUTS MACHINING COSTS ON REAR AXLE HOUSING



PRODUCTION COSTS

THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

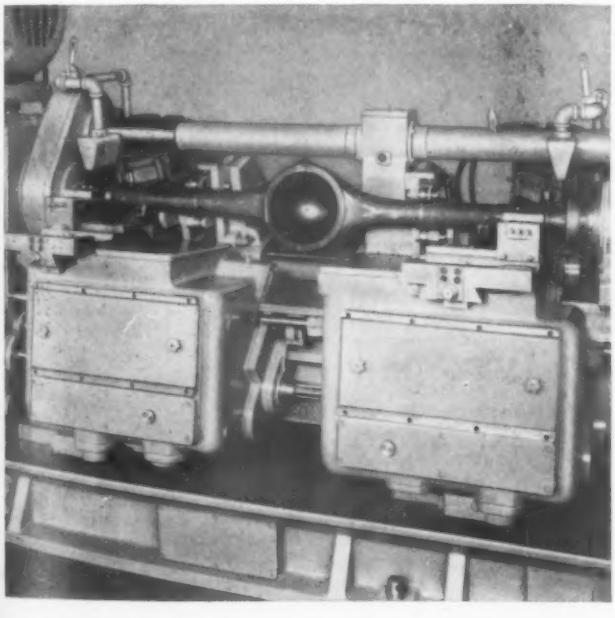


Problem: To turn and face both ends of Rear Axle Housing simultaneously.

Solution: The Model AR Automatic Lo-swing Lathe selected for this job was equipped with a Double End Drive to secure a balanced, efficient drive and prevent torsional deflection of the Axle Housings while under cut.

The right-hand Head of the Double End Drive Mechanism is a massive, two-piece unit securely clamped to the ways of the bed. Its top part slides on large bearing surfaces and is pneumatically-operated to facilitate loading and unloading of the work. The large diameter drive shaft for this head is splined to permit free longitudinal movement of the sliding member, and is supported with a central bearing.

The close-up view below shows details of the tooling and also the two spring-loaded vibration dampeners which prevent vibration of the out-of-balance part when revolved at high speed. This view also shows the two front carriages; the left-hand carriage feeds towards the headstock while the right-hand carriage feeds towards the tailstock. The mechanism for reversing the feed on the right-hand carriage is enclosed in the housing shown on the extreme right-hand end of the bed in the overall view.



The axle housing is driven with two pneumatically-operated expanding segments . . . the air operating cylinders being mounted directly on the right and left hand Driving Head Spindles. Details of the tooling are shown in line drawing.

The operating cycle consists of loading the Axle Housing in two cradles, after which the sliding member of the right hand head advances and locates the housing endwise in relation to the driving chucks. This first movement is controlled by a four-way air valve at the right hand end of the machine. The second movement of this valve closes the two driving chucks. The machine is then started with the main clutch control lever located on the right side of the right-hand carriage, which is the normal operating position.

The automatic machining cycle then takes place and the machine stops automatically at the end of the cycle, ready for unloading and reloading. Consult Seneca Falls Engineering Staff on your turning problems.

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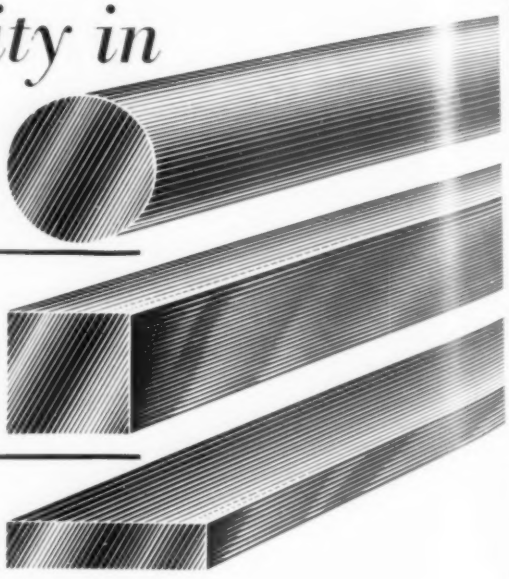
Finest Quality in

Sure Spec Drill Rod is high grade tool steel . . . comes in manufacturer's standard sizes at low prices!



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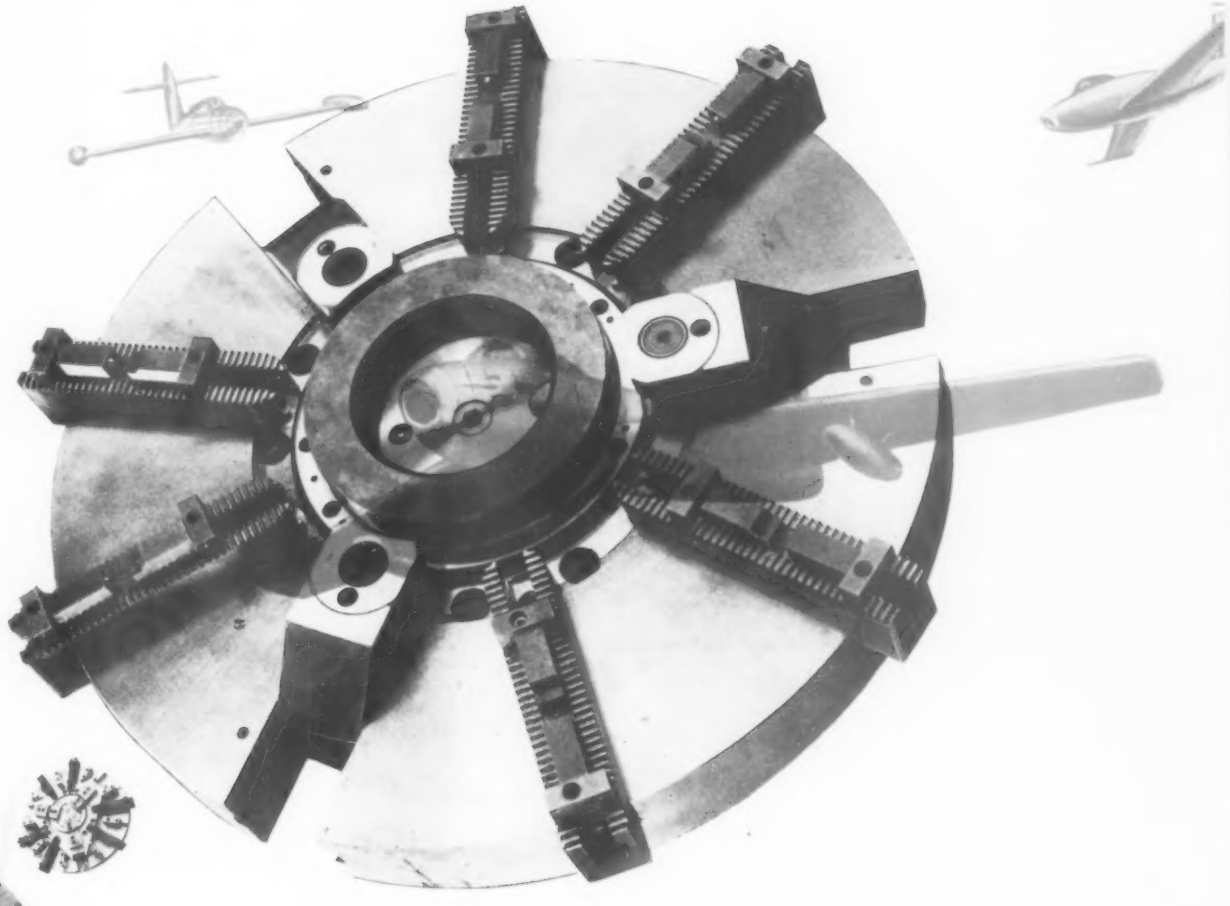
Jet Engines create *chucking* problems



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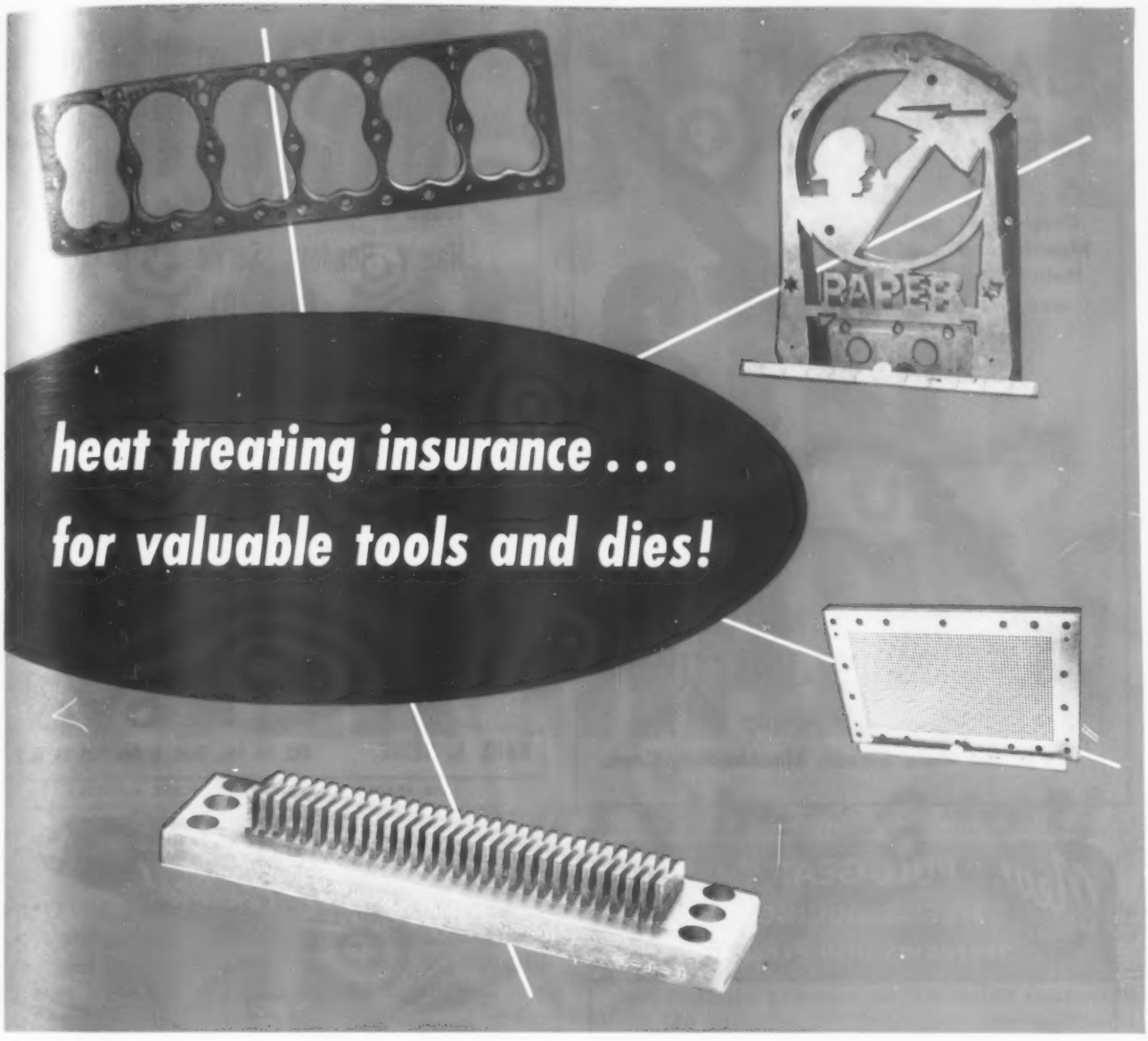

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And constant pressure machinability tests show Graph-Mo machines 30% faster than other tool steels. (Machinability test data on request.)

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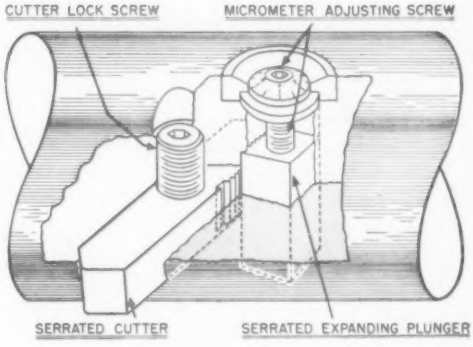

Whatever your boring problem, if Davis can't bore it — it can't be done!

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GIDDINGS & LEWIS MACHINE TOOL COMPANY
FOND DU LAC, WISCONSIN, U. S. A.

production time cut in half with SCAN-A-SCALES

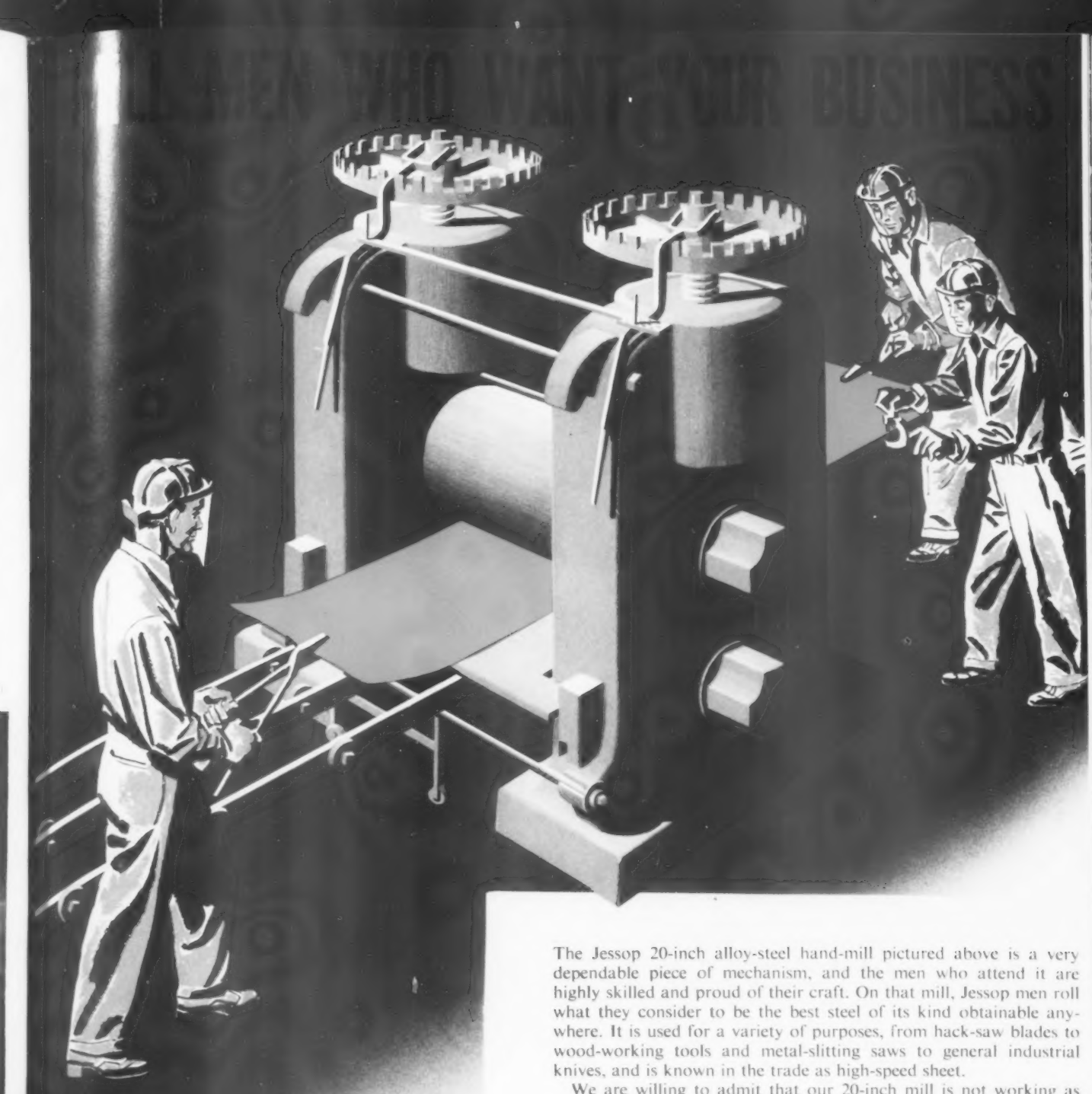
USED ON VERTICAL MILLERS, THEY PROVIDE SAME RESULTS AS A JIG BORER FOR NEW JERSEY MANUFACTURER

A Newark, N. J. precision tool manufacturer was using verniers, micrometers and plugs for locating 144 holes to be bored by vertical millers in a die plate. It required an hour to locate each hole and production was slow.

Scan-A-Scales, optical measuring instruments, were installed on the vertical millers and time for locating each hole was reduced to less than half-an-hour. Accuracy to within ±.0002 is now obtained and, in addition, production is speeded. The company reports it gets the same results from a vertical miller with Scan-A-Scales that it gets with a $10,000 jig borer without Scan-A-Scales.

A very precise and simple method of making linear measurements on machine tools is provided by Scan-A-Scales. They eliminate the element of pressure with its variables, operators don't have to pay attention to lead screw settings and there is no backlash. They cannot be damaged by power feeds and no focusing is required.

Scan-A-Scales' optical principle offers definite advantages over other methods, providing a faster more dependable method of making measurements than length rods, vernier scales and lead screws. As a result, Scan-A-Scales soon pay for themselves in time saved. Machine tool manufacturers are now including Scan-A-Scales as original equipment and they can also be easily installed on new or old machines in your shop. Write today for your free copy of our new illustrated catalog. F. T. Griswold Mfg. Co., Devon, Pa.



The Jessop 20-inch alloy-steel hand-mill pictured above is a very dependable piece of mechanism, and the men who attend it are highly skilled and proud of their craft. On that mill, Jessop men roll what they consider to be the best steel of its kind obtainable anywhere. It is used for a variety of purposes, from hack-saw blades to wood-working tools and metal-slitting saws to general industrial knives, and is known in the trade as high-speed sheet.

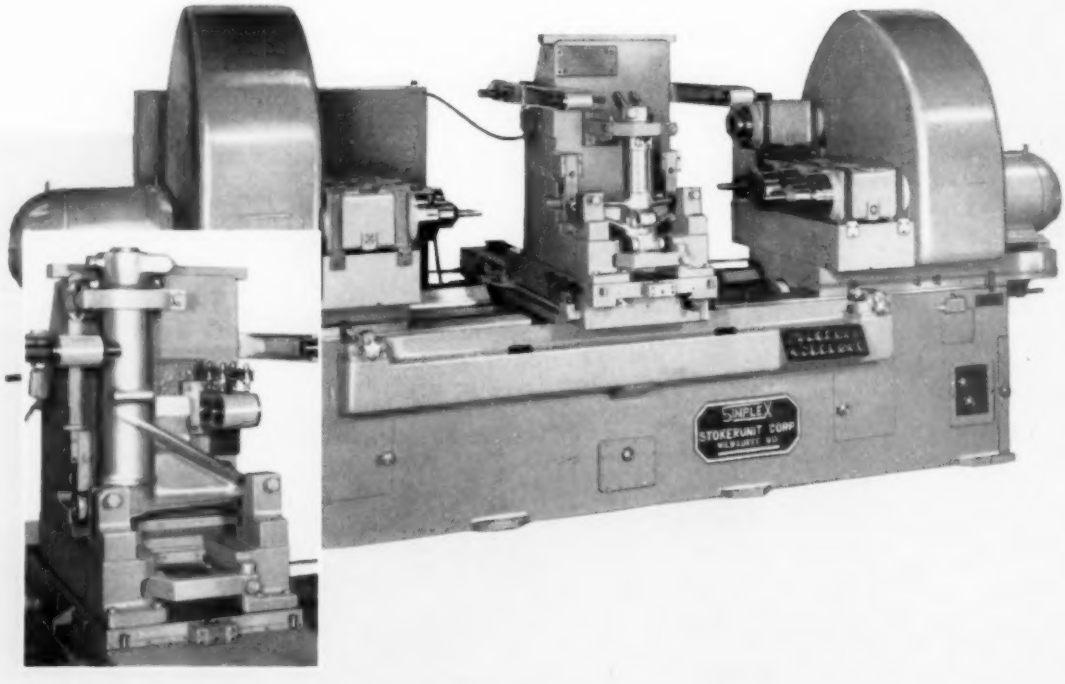
We are willing to admit that our 20-inch mill is not working as many shifts as those enthusiastic Jessop mill men would like it to work. Here's what they would like you to do. If you have any idea your company might use this type of steel, contact Jessop. You will gain, because every member of the Jessop team, including the men on this mill, will strive to bring you better steel on a better delivery schedule than you have ever known before. Please write or call.

JESSOP

STEEL COMPANY · WASHINGTON, PENNSYLVANIA

Simplex

YESTERDAY *an Idea*
TODAY *a Reality*

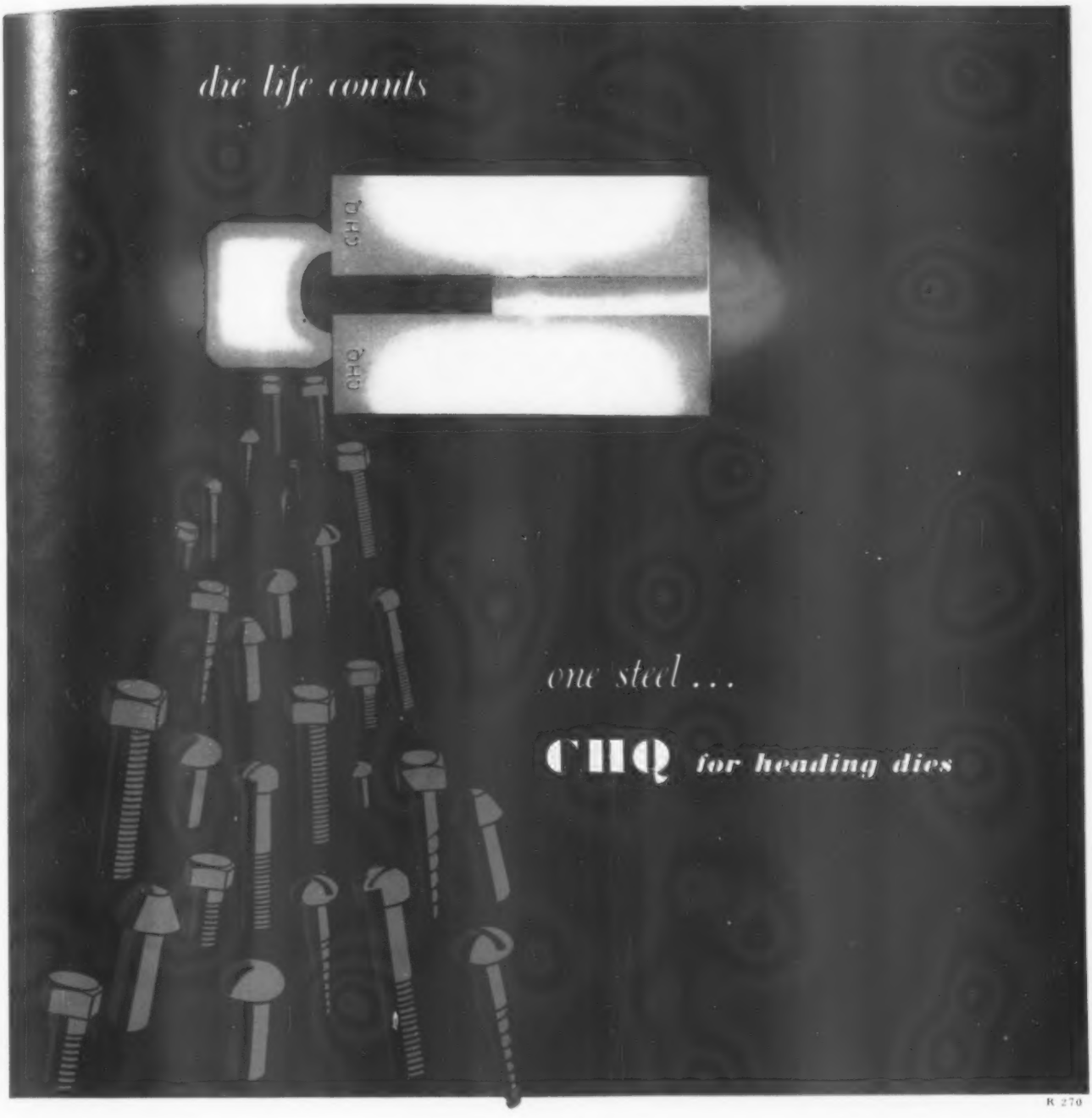


Three different aircraft landing gear parts having similar machining operations were tooled up on the pictured SIMPLEX #4U 2-Way Precision Boring Machine. A total of seven #4 SIMPLEX Precision Boring Heads were used to perform the drilling, semi-finish boring, milling, and finish boring operations on the trunion ends of the parts. Tools supported in the heads on the left hand and right hand table performed their operations simultaneously, reducing the machining time to a minimum.

Simplex **PRECISION BORING MACHINES**

SIMPLEX MACHINE TOOL DIVISION
STOKERUNIT CORPORATION
4528 WEST MITCHELL STREET
MILWAUKEE 46, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES • SPECIAL MACHINE TOOLS



R 270

ONE STEEL—CHQ—is all you need for all cold heading die jobs. Firth Sterling controls the analysis and hardenability of CHQ by size. Therefore, CHQ provides a practical, economical method of increasing header die life and reducing inventories.

Here is how:

1. **Carbon content controlled by size.**
2. **Hardenability controlled by size.**
3. **Controlled analysis for uniform results.**
4. **Eleven steps of quality inspection.**
5. **100% inspection on each bar.**

Firth Sterling's years of experience in the application of Carbide and Steel to the Cold Heading industry is additional assurance that CHQ will consistently do the job on your Cold Heading applications. You can be certain that CHQ is *truly* Cold Heading Quality.

Firth Sterling INC.

OFFICES* AND WAREHOUSES: HARTFORD NEW YORK* DETROIT CLEVELAND DAYTON* PITTSBURGH* CHICAGO BIRMINGHAM* LOS ANGELES PHILADELPHIA*

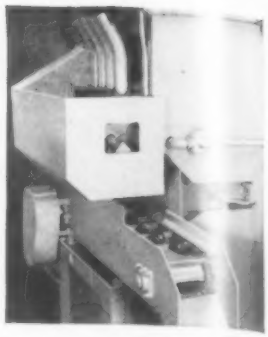
GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

FOR FURTHER INFORMATION, USE READER SERVICE CARD: INDICATE A-11-231

13,600 Splines/hour on one machine

The part: Steel forgings in which 17 internal splines of 1½" O.D. are to be broached.

The machine: A Colonial 20-ton 48" stroke Pull-up with multiple loading chutes, positioning shuttle and automatic ejector conveyor.

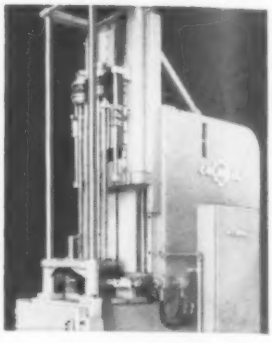


Colonials help you do MORE JOBS on FEWER MACHINES

12 Surfaces, 8 Bores on two machines

The part: Tank track forging requiring finishing of 6 flat surfaces and 4 bores in thin webs, broached two at a time.

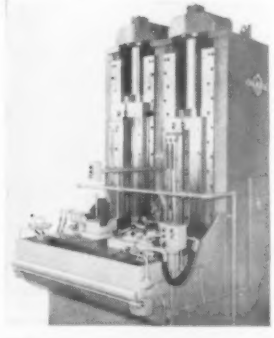
The machines: Colonial 25-ton Dual Ram for flat surfaces, Colonial Pull-down with automatic spreaders to support the part while broaching bores.

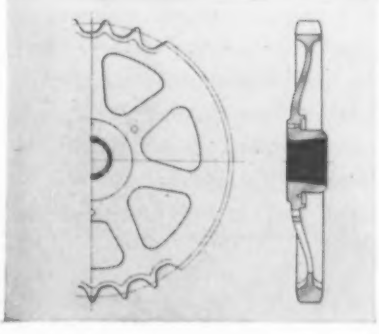


7 Surfaces, 4 Operations on two machines

The part: Tank track center guide to be completely machined as shown.

The machines: Two 25-ton Dual Ram machines perform all operations, produce one guide for each machine cycle.

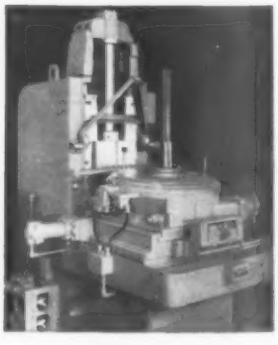




Large Tapered Splines Broached in One Setup

The parts: Tractor wheel hubs, (several sizes).

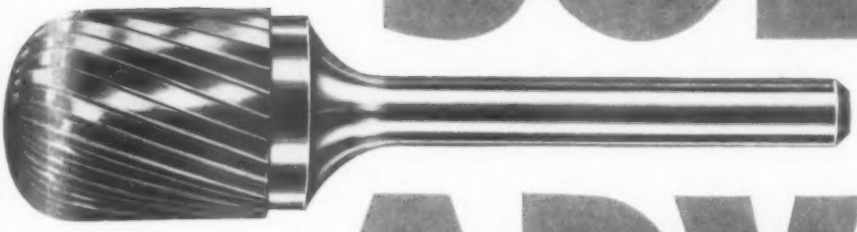
The machine: Colonial 15-ton Pull-down equipped with special angular short-shuttle table, and automatic index.



PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH CO. DETROIT 13

For further information on the examples shown here, ask for Broaching News, Volume XIV, No. 1

SOLID ADVICE



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We can prove to you that it pays off to specify ATRAX precision tools ground-from-the-solid. It pays off in longer service, less production difficulties —and that means better profits for you. Send for our complete catalog, or let our engineers consult with you about your needs.

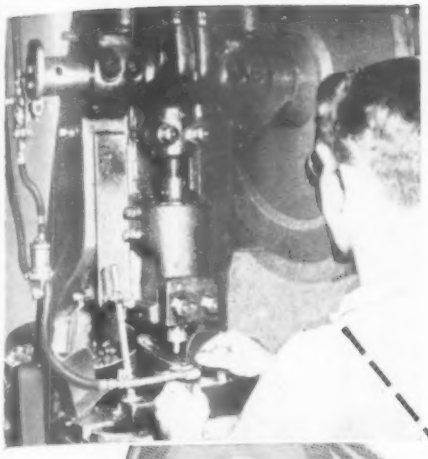
Representatives and Distributors in Principal Cities in the United States and Canada. Write us for the Name and Address of our representative in your area.

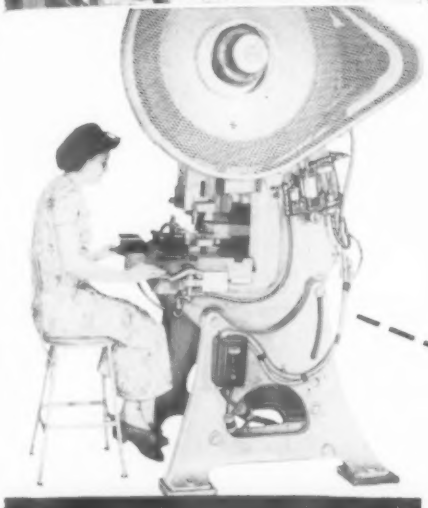
PRECISION MACHINE GROUND BURS, REAMERS, END MILLS, BORING BITS and OTHERS

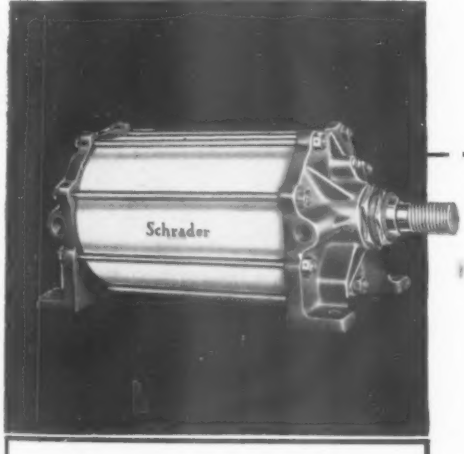
Send for complete catalog NOW!

THE ATRAX COMPANY

NEWINGTON 11, CONNECTICUT







Some equipment just naturally boosts production

. . . Schrader Air Controls for instance. *You can't help* getting smoother, faster operations with air power on your side.

The tireless muscles of compressed air lighten labor all along the production line.

● *For ejection of work,* Schrader Air Ejection Sets automatically eject finished parts . . . eliminate tedious hand removal or bulky mechanical devices.

● *On power presses,* press brakes, and any machine using either a friction or mechanical clutch, Schrader Machine Controls promote building a high-speed work rhythm that pays big production dividends with safety.

● *All over the shop,* Schrader Air Cylinders are faithfully on the job, delivering more powerful straight-line forces than any other commonly used power units of equivalent size or weight.

These are only three of the many hundreds of new and improved Schrader Air Control Products that build production and safety in your plant. It's easy to plan their use in many places in your shop. Write, outlining your installation, your idea—or fill out the coupon below.

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Division of Scovill Manufacturing Company, Incorporated
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I am interested in more information on.....

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Company_____

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23 MEEHANITE Castings in this HiDUTY Lift Truck

TRANSITIER Truck Co., Portland, Oregon, specify 23 important cast components in their line of HiDuty Lift Trucks (Fig. 1) in Meehanite metal. The importance of these parts is further emphasized by the fact that in recent months a number of them have been redesigned from original steel and bronze specifications. In addition to the ones shown, the following parts are Meehanite castings:

1. WHEEL SPACER
2. HYDRAULIC VALVE BODIES(2)*
3. CLUTCH DRIVEN PLATE
4. CLUTCH SUPPORT
5. TRANSMISSION CASE
6. BRAKE DRUM
7. WHEEL HUB(1)*
8. HYDRAULIC CYLINDER PACKING NUT (2)*

In addition to similar parts shown.

The design and specification of these components is a good example of the beneficial results of team work between a foundry manufacturing high property, high quality castings, and a manufacturer alert to the possibilities of incorporating dependability into his product through proper specification. The use of Meehanite castings provides a sure knowledge that both service and production requirements will be met regularly and repeatedly.

Write for our new Bulletin 35 "Meehanite Castings Serve all Industry."

Take *YOUR* Casting Problem To A MEEHANITE FOUNDRY

American Brake Shoe Co.	Mahwah, New Jersey
The American Laundry Machinery Co.	Rochester, New York
Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irvington, New Jersey
E. W. Bliss Co.	Hastings, Mich. and Toledo, O.
Builders Iron Foundry	Providence, Rhode Island
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
Crawford & Doherty Foundry Co.	Portland, Oregon
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio and Grove City, Pa.
Empire Pattern & Foundry Co.	Tulsa, Oklahoma
Farrel-Birmingham Co., Inc.	Ansonia, Connecticut
Florence Pipe Foundry & Machine Co.	Florence, New Jersey
Fulton Foundry & Machine Co., Inc.	Cleveland, Ohio
General Foundry & Manufacturing Co.	Flint, Michigan
Greenlee Foundry Co.	Chicago, Illinois
The Hamilton Foundry & Machine Co.	Hamilton, Ohio
Hardinge Company, Inc.	New York, New York
Hardinge Manufacturing Co.	York, Pennsylvania
Johnstone Foundries, Inc.	Grove City, Pennsylvania
Kanawha Manufacturing Co.	Charleston, West Virginia
Lincoln Foundry Corp.	Los Angeles, California
E. Long Ltd.	Orillia, Ontario
Otis Elevator Co., Ltd.	Hamilton, Ontario
The Henry Perkins Co.	Bridgewater, Massachusetts
Pohlman Foundry Co., Inc.	Buffalo, New York
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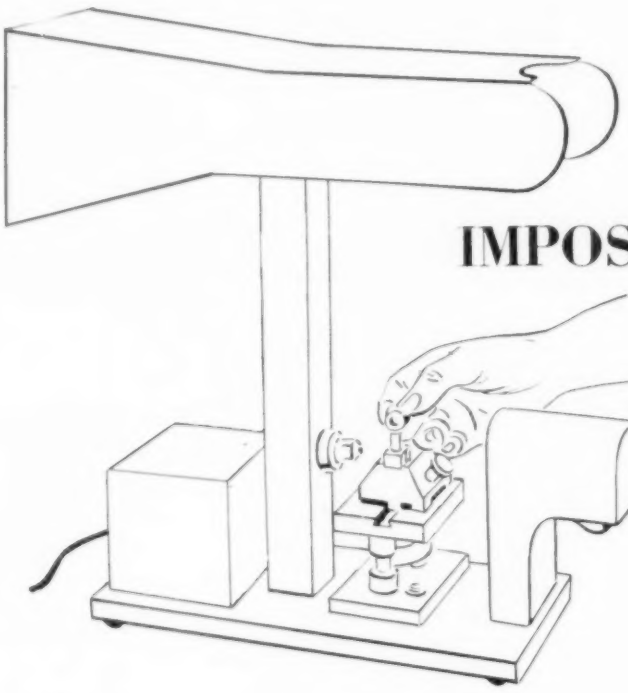
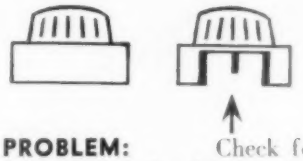
"This advertisement sponsored by foundries listed above."

MEEHANITE® NEW ROCHELLE, N. Y.





PROBLEM: Check for concentricity and straightness of a delicate "hidden pin."

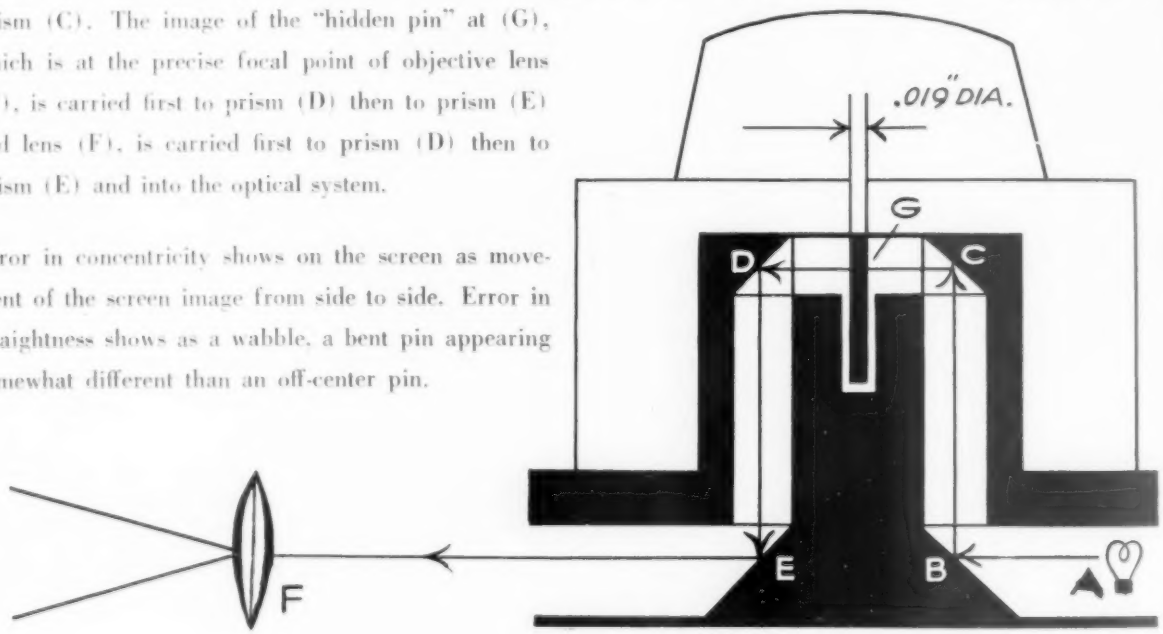
IMPOSSIBLE SITUATION?

SOLUTION:

Mechanical gages were not sufficiently sensitive, accuracies were close and ordinary optical projection techniques could not be applied. This "impossible" situation was solved by using a novel staging fixture using four (4) small prisms.

Product part when rotated about staging fixture arbor reveals the condition of its "hidden pin" relative to the inside diameter of the product (Note: By using a "V"-block instead of an arbor the condition would be relative to the product outside diameter). Light from source (A) is reflected from prism (B) to prism (C). The image of the "hidden pin" at (G), which is at the precise focal point of objective lens (F), is carried first to prism (D) then to prism (E) and lens (F), is carried first to prism (D) then to prism (E) and into the optical system.

Error in concentricity shows on the screen as movement of the screen image from side to side. Error in straightness shows as a wabble, a bent pin appearing somewhat different than an off-center pin.

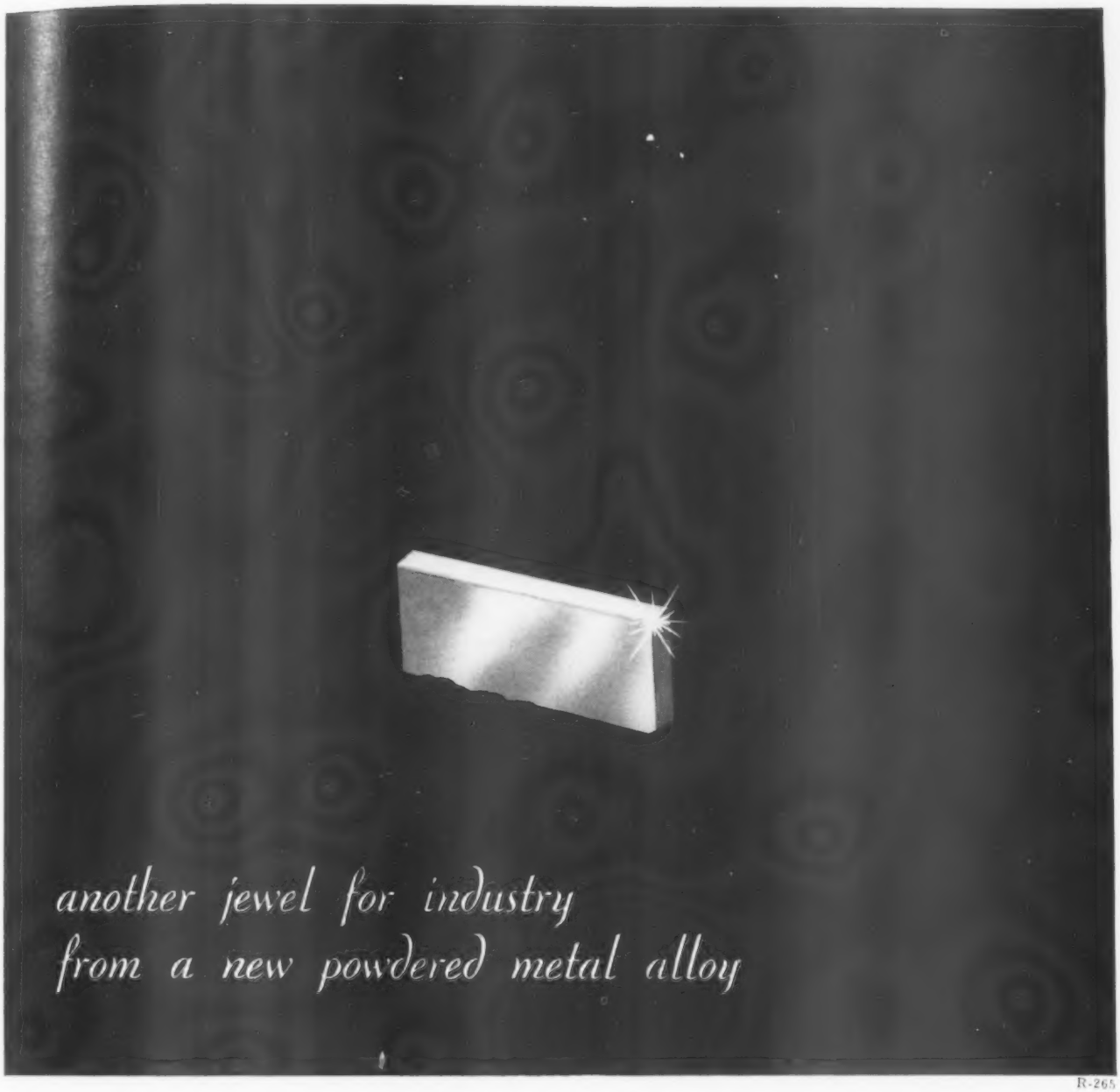


TIME CYCLE—240 per hour depending on skill of the operator.

EQUIPMENT NEEDED—1—S&Y Model 66HC (Horizontal Contour) Projector; 1—Type No. 2 Jackscrew Stage; 1—Special Holding fixture.

COST—Less than $1,000.00 including Engineering.

Stocker & Yale
INCORPORATED
MARBLEHEAD, MASS.



R-265

Firth Sterling Chromium Carbide For Gage Blocks

To meet exacting requirements, gage manufacturers are demanding Firth Sterling Chromium Carbide for the production of gage blocks. This new powdered metal alloy, Another First from Firth, embodies the following precise characteristics—

Write for Chromium Carbide Brochure

Chromium Carbide Gage Blocks

Light in Weight (Sp. gr. 6.97).
High Hardness (89 Rockwell A).
Corrosion Resistant (10 times stainless steel (18.8).
Expansion Coefficient (Similar to Steel).
High Polish (.15 micro-inches).

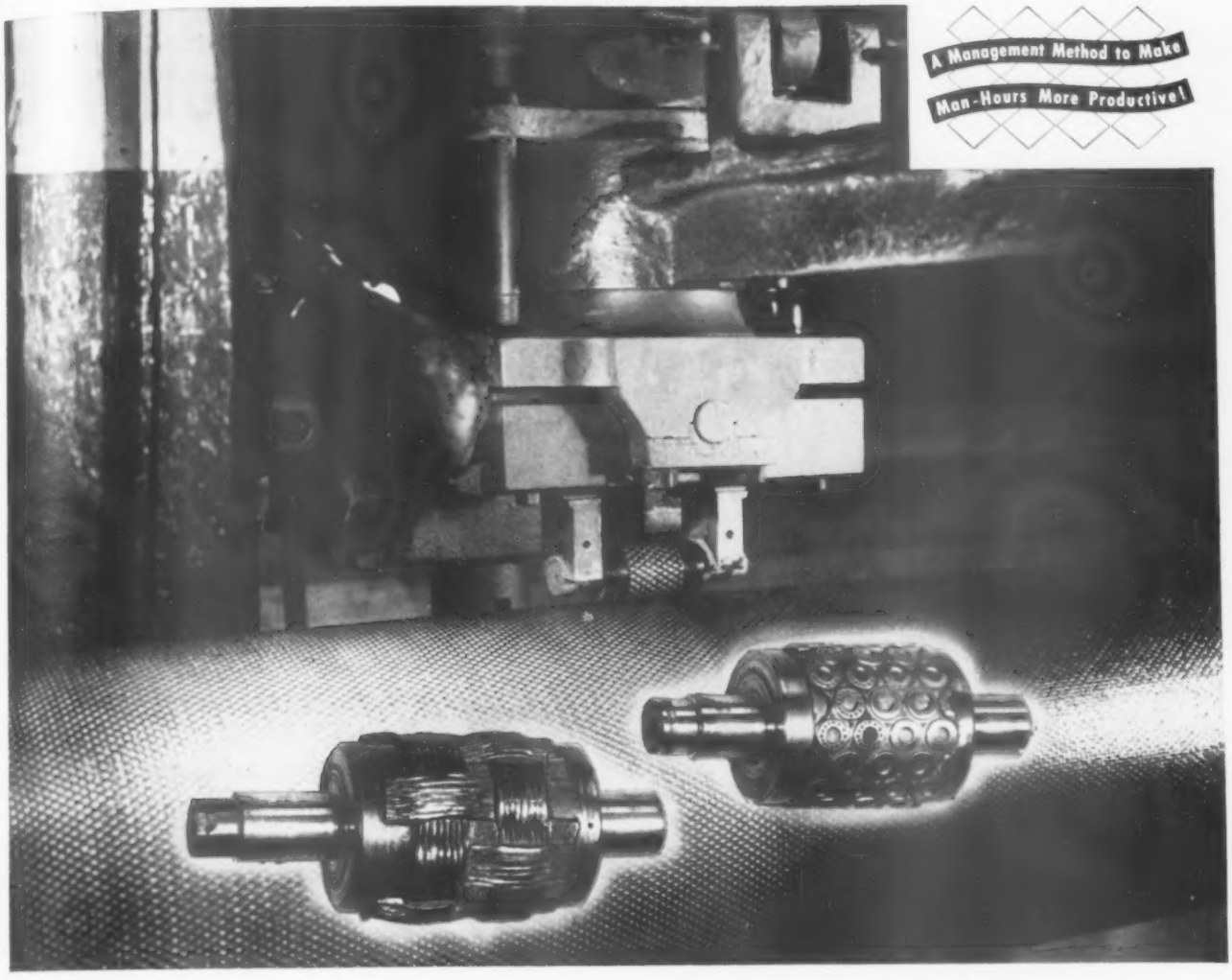
Firth Chromium Carbides are being appraised for application in many other industries where resistance to corrosion, heat and abrasion are required. Wide use seems imminent in the Glass, Ceramic, Chemical, Food, Textile, Pharmaceutical, Oil, Die Casting, and Machine Tool Industries.

From a powdered metal alloy, Firth Sterling presents another jewel to meet the demand for industry's modern requirements.

Firth Sterling INC.

OFFICES* AND WAREHOUSES: HARTFORD NEW YORK* DETROIT CLEVELAND DAYTON* PITTSBURGH* CHICAGO BIRMINGHAM* LOS ANGELES PHILADELPHIA*

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.



A Management Method to Make Man-Hours More Productive!

How to Put Delicate Patterns Through a 5-Ton "Wringer", Successfully

These knurling mills, made from No. 11 Special (Water-Hard) Tool Steel, press artistic patterns into large steel rolls for embossing cloth, paper and plastic. Here's what was required of the tool steel: It had to be hard enough to prevent upsetting; tough enough to prevent delicate edges from breaking under operating pressures up to 5 tons. Patterns on the mills were quite fragile and sections as deep as 1/16" could not collapse. Further, the steel had to heat treat with very little warpage.

But picking the proper steel wasn't as tough as you may imagine. For the Carpenter Matched Set Method not only indicated the one *best* steel for the job but enabled production management to "call its shots" . . . have the mills produce the required number of patterns on schedule, with less costly downtime.

For any plant making or using tools and dies, the Matched Set Method offers even more advantages than simplified selection. You benefit from lower tool steel inventories, heat treating economies, simplified toolroom and production procedures. To discover how it can work for you in your plant, write for the new booklet "How to Get Better Tool and Die Performance". THE CARPENTER STEEL CO., 154 W. Bern St., Reading, Pa.

Export Department:
The Carpenter Steel Company, Port Washington, N. Y.
"CARSTEELCO"

Carpenter

MATCHED TOOL & DIE STEELS

More than top-grade steels . . . a Method to keep tooling and production on schedule!

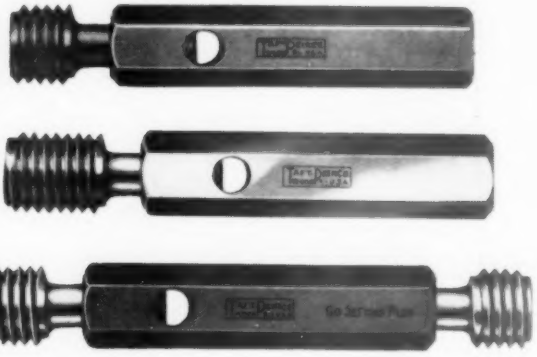
For your convenience, Carpenter carries warehouse stocks in principal cities throughout the country

For Precision *Plus* Economy

SPECIFY
TAFT-PEIRCE THREAD GAGES

T-P ROTOCHEK.

It's the fastest thread gaging method yet devised. Push — and the gage screws into the work. Release the pressure and it stops. Pull — and it disengages. Accommodates A.G.D. taperes No. 00, No. 0, No. 1, No. 2, and No. 3. Special sizes on request.

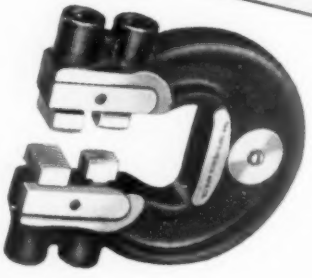


T-P LIMIT THREAD PLUG GAGES

Special heat treatment locks-in precision . . . provides miles more gaging service. Removable thread ends save on replacement. Available in Taper Lock or Reversible standard sizes. Steel or Tungsten Carbide.

T-P THREAD RING GAGES

Single unit clamping device simplifies setting . . . eliminates possibility of distortion . . . increases accurate gaging life. Available in standard sizes.



T-P ADJUSTABLE SNAP THREAD GAGES

Faster to operate than ring gages, they feature *complete thread* inspection . . . rigid mounting . . . maximum range of adjustment. Available in standard sizes with Steel or Tungsten Carbide Anvils.

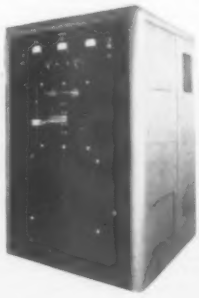
For the complete story on these items and many more, get your copy of the new Taft-Peirce Handbook.

The TAFT-PEIRCE Manufacturing Co.

WOONSOCKET, RHODE ISLAND

T-P means Top Precision

DEPT. OF DEFENSE work . . . by *LINDBERG* Induction Heating Units



L. A. Young Spring & Wire Corp., Detroit, Mich., use two 5 KW Lindberg Induction Heating Units for production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting requirements.

We can't tell you much about the manufacturing processes at the L. A. Young plant (due to security restrictions) . . . but we can tell you about the many rugged construction features of this equipment . . . features which make it so dependable that the L. A. Young organization selected Lindberg Induction Heating Units for their important Department of Defense work. These points of design and construction will minimize costly breakdowns and aggravating work stoppages:

Filament voltage regulation transformers keep tube filament voltages at proper values regardless of line fluctuations. The end result . . . longer tube life.

Checklites . . . A system of indicating lamps instantly reveals any abnormal operating conditions . . . simplifies servicing.

Work coil burn-out protection . . . An electrical interlock system makes it impossible to turn on power when cooling water is not flowing.

Long-life industrial tubes feature shortened internal structure . . . Kovar metal-to-glass Seals . . . heavy walled anodes.

Sealed tank capacitors are hermetically sealed against dirt and dust . . . require no servicing or refilling.

Investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.

LINDBERG

HIGH FREQUENCY DIVISION
LINDBERG ENGINEERING COMPANY,
2450 West Hubbard Street, Chicago 12, Illinois

Index of The Tool Engineer Advertisers

November, 1952

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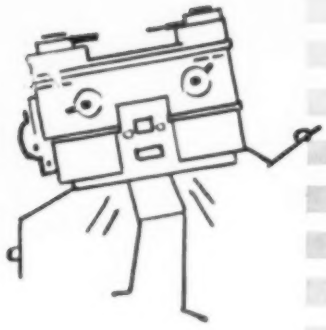


if your machines could talk they would choose...

BENCO COLLETS

If your machines could select their own collets, they would ask for Benco Collets. Many machines are blamed for poor production records yet the only thing wrong is the poor quality of the collets used.

Benco Master Collets run truer, grip tighter and work faster, thereby increasing the quality and quantity of your production regardless of the make of machine or type of material you use.

You reduce set-up time with Benco Master Collets since the pads are quickly changed without removing the collet from the spindle. Concentricity is assured through expert manufacturing processes and rigid inspection. Benco Collets are cam-ground on the taper...allowing them to open faster, close quicker and grip tighter.

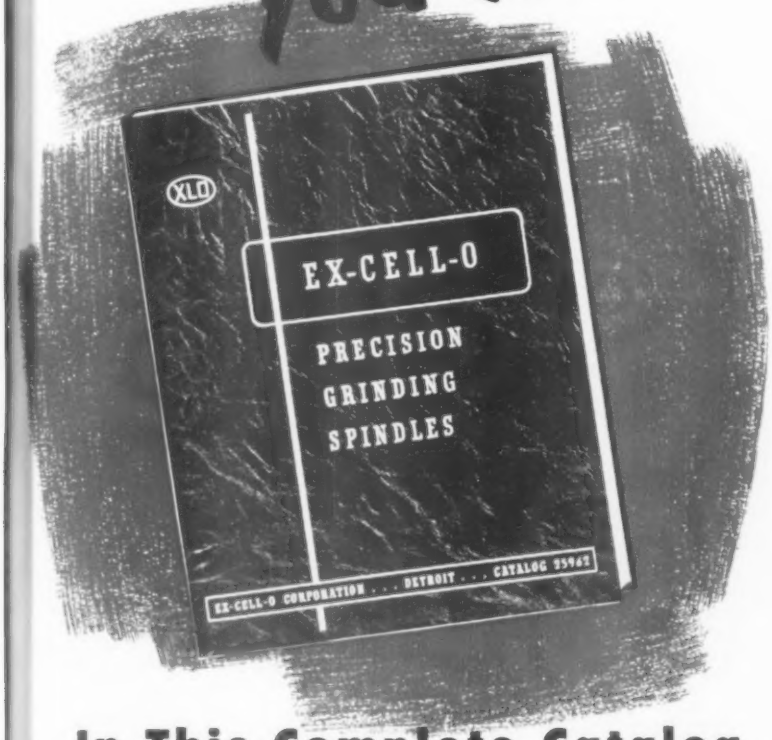
Equip your machines with Benco Collets and get extra output from every machine!

BENCO COLLET MANUFACTURING CO.

1560 EAST 27th STREET CLEVELAND 14, OHIO

Always Better Constructed Accurate Benco Collets, Pushers and Pads

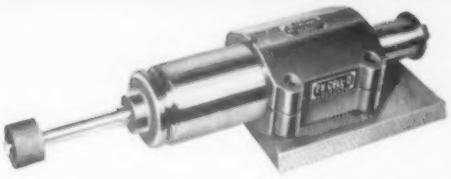
The Spindle You Want



In This Complete Catalog

For speed, precision, endurance, your best choice is an Ex-Cell-O Grinding Spindle. You'll find one to suit your needs in the big, 80-page Ex-Cell-O Catalog 25962, supplied with price list on request.

● Leading grinder manufacturers install Ex-Cell-O Precision Spindles as original equipment. You can improve the performance of your grinders with Ex-Cell-O Precision Spindles. They are rigid and smooth-running, permit heavy cuts without chatter, require no lubrication or adjustment. All are fitted with precision ball bearings manufactured by Ex-Cell-O.



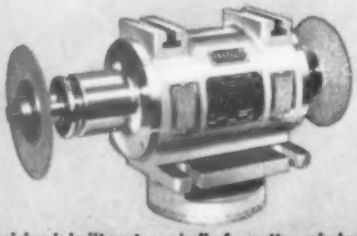
Single-body, belt-driven internal grinding spindle.

Double-body, belt-driven internal grinding spindle.

65,000 rpm high frequency inbuilt motor spindle.

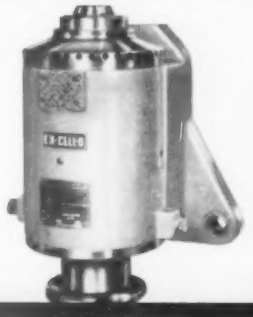
25,000 rpm high frequency inbuilt motor spindle.

Totally enclosed inbuilt motor surface grinder spindle.



Precision inbuilt motor spindle for cutter grinder.

Vertical precision spindle with inbuilt motor.



EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS
RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT
AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

XLO
EX-CELL-O for PRECISION

Announcing

the New Revolutionary

WALES

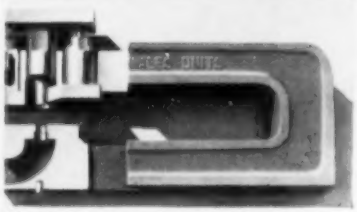
Hydra-Spring®

With Up to 600% More Pressure

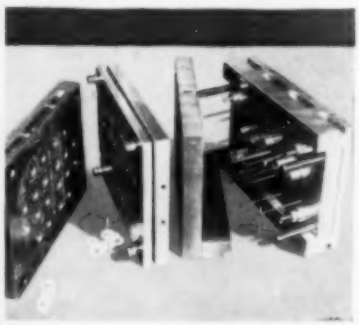
(Patents applied for)

®TRADEMARK

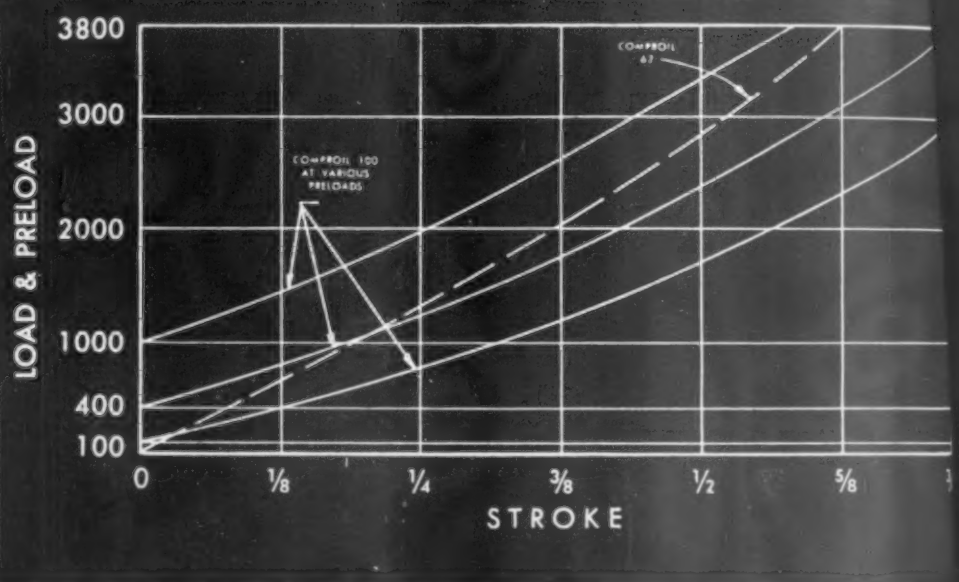
The small, compact Wales Hydra-Spring delivers as much spring pressure as the big, heavy railroad car coil spring.



Showing cutaway view of Wales Type "HS" Hole Punching Unit for punching and stripping *material* up to ¼" thick. The heart of the Wales Type "HS" Hole Punching Units is the pair of Wales Hydra-Springs.



Showing a group of Wales Hydra-Springs in a plastic ejection mold die.



● Wales Hydra-Springs SOLVE THE AGE OLD STRIPPING PROBLEM by providing *much greater* stripping pressure than the ordinary coil springs of similar size. In addition to simplifying die design and die making, *Wales Hydra-Springs make possible die operations that were previously impossible.*

For the first time, stripping pressures may be adjusted by simply adding or reducing the volume of SPECIAL COMPRESSIBLE FLUIDS KNOWN AS WALES COMPROILS. The above graph dramatically shows the extra high pressure characteristics of the revolutionary Wales Hydra-Springs using various Wales Comproils, strokes, loads and pre-loads.

Yes, there is always something new in the Wales Line. This time it is the three models of Wales Hydra-Springs. It is too big a story to tell here so write TODAY for complete information.

WALES-STRIPPIT CORPORATION

George F. Wales, *Chairman*

393 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment